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Present Day Warfare

Jacques Rouvier



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PRESENT-DAY WARFARE



TWO FRENCH BOMB-THROWERS ABOUT TO START FOR THE
GERMAN TRENCHES

PRESENT-DAY WARFARE

**HOW AN ARMY TRAINS
AND FIGHTS**

BY

CAPTAIN JACQUES ROUVIER

**OF THE FRENCH MILITARY MISSION TO THE
UNITED STATES**

ILLUSTRATED

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PREFATORY NOTE

My idea is not to write a book on tactics—and interesting only to officers. I shall simply try to make clear to the civilians of this country, whose boys are “over there,” the conditions of warfare in the present day.

JACQUES ROUVIER.

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PRESENT-DAY WARFARE

CHAPTER I

A GENERAL DISCUSSION OF THE CHANGES IN ORGANIZATION, EQUIPMENT, AND TRAINING MADE NECESSARY BY THE METHODS OF MODERN WARFARE

CONDITIONS in this war are so different from what had been expected that great changes have been made in tactics. These tactical changes, combined with the use of many new instruments of warfare, have compelled certain changes in organization and a very decided revision of the methods of training the soldier. Advantage has been taken of every modern invention; the greatest scientists of the world have aided in the production of means of offense and defense; only the most exact methods are permissible; the strictest attention is devoted to the most minute details; and the preparation for each contemplated movement must be as nearly perfect as possible. As the war develops, material plays a more and more prominent part, and, whereas we formerly emphasized the "man behind the gun," we now emphasize the machine

which is behind the man. Material can be used in open warfare only to a limited extent as it would not be practicable to furnish the great amount of transportation which immense quantities of material would require even if it were not impossible to make use of it on account of the rapid movement of the troops under those conditions. This explains why, when the war started, none of the belligerents had many guns of large calibre: it was not considered feasible to transport guns of such great size and weight. Of course, the utilization of railroad artillery in open warfare is out of the question because most of the time there are no railroads available for the purpose near the battle-field.

In open warfare huge armies are expected to come into contact on a terrain where manœuvring is possible; decisive battles are fought on extensive areas, and as a result of strategical movements consisting, for example, in bringing up on the enemy's flank a great number of troops, such stupendous blows are dealt the enemy that his armies must retreat or surrender. Every effort is made to be stronger than the opponent at the selected point of encounter and at a certain time. To accomplish this end surprise is necessary and changes of position have to be made without the enemy becoming aware of them. The secrecy of such operations must be assured if success is to be attained, and this necessitates the

completion of vast movements in a short time, resulting in long and tiring marches of the troops engaged.

In battles fought in open warfare, as in the battle of the Marne, no system of trenches could be built; when the men found they could not advance on account of the violence of the enemy's fire they had to construct shelter with the intrenching-tools which they carried with them, and which formed a part of their equipment. It was no use running away, as the bullets would soon overtake the cowards, so the troops who fought in extended order simply lay down and tried to dig themselves quickly into the earth to avoid losses and also to be able to hold their ground. Each man dug for himself a hole to afford him some shelter. It is easy to understand that the troops could not live under such conditions for a long time because they could get neither supplies nor reinforcements, having no sheltered means of communication and being under the enemy's fire. On the other hand, such lines of rifle-pits are very easy to defend against an enemy attacking them in front, but cannot be defended if the enemy succeeds in turning them and getting at their rear.

After the battle of the Marne the French tried to deliver a decisive blow on the German right flank in order to compel the enemy to retire from the

trenches occupied on the Aisne and to the south. This attempt on the part of the French to outflank their opponents was met by a constant extension of the German trenches and a counter-effort to envelop the French left flank. Thus resulted what has been called "the race to the sea." When at last the French and German lines reached the North Sea, both armies had to settle down where they were because movements around either flank were no longer possible, one flank being protected by the sea and the other by the mountains of neutral Switzerland. Both flanks resting on impassable obstacles, the foes were forced to deliver frontal attacks and only trench warfare was possible. But this method of warfare is not new nor unheard of; neither did it take birth from the genius of some German general, as some people assert. Trench warfare existed during the Civil War in the United States, but it is now conducted in greater magnitude than ever before in the history of the world.

The opponents found themselves face to face after the battle of the Marne and the race to the sea, in some places the trenches being separated by only a few yards. Both tried to make life possible where they were. The line of rifle-pits was transformed into more roomy trenches, in which men could stand and move about without being shot. Boyaux, that is to say, trenches running

back from the firing-line, were dug to allow the men to walk from the firing-line to the rear without detection. This permitted the transportation of supplies of all kinds and the evacuation of wounded and sick, and rendered possible the relief of the trench garrison—that is, the replacing of troops who had remained for a certain length of time in the trenches, troops worn out by ceaseless strain and by losses—by troops who had been at rest-billets in rear of the lines. This is generally a very tedious and difficult operation, but it must be accomplished if the ground is to be held.

As the troops settled down to a warfare in the trenches, the opponents tried to avoid surprise attacks, and for this purpose protected their trenches with every kind of defense and obstacle which could be devised. Both sides had to create and improve their war material—big guns and powerful howitzers were built and made ready to go into action.

Automatic rifles and machine-guns in large numbers were added to the armament, which increased the fire-power of infantry and which, combined with the ordinary rifles, could pour a sufficient shower of bullets on the enemy to check any offensive movement, and this occasioned terrible losses especially to units which delivered the assault in mass formations, as the Germans did during the Ypres battle. I remember a German company

which made a counter-attack on a part of the line held by my regiment, the 67th Infantry, in very close order, in which nearly all were killed. This happened on the night of the 5th of May, 1917. At daybreak we could see in front of our trenches the corpses of that whole German company, at the head of which lay that of its captain, sword still in hand.

Arms with curved trajectories also had to be provided to dislodge the Germans concealed either in the trenches or in their shell-holes, and for this purpose hand and rifle grenades have proven very efficacious. It was also necessary to be able to dislodge the enemy who held out stiffly in a part of a trench, and for this we use flame-throwers that are able to send flames to a distance of thirty to forty metres. These have been much used in the late offensive on the Aisne. It must be said that the Germans first took the initiative in using these new means of warfare.

The artillery has been subjected to many innovations during the progress of the war, one of the most important being the great use of guns of large calibre. These were found necessary because the guns of the field-artillery were unable to reach the enemy protected in dugouts well beneath the surface of the ground, which could only be destroyed by shells containing large quantities of high explosive. Another interesting feature of the development of ar-

tillery is the increase in the number of guns of all calibres in a small area to result in a concentration of fire which, with all guns firing at a rapid rate, is called "drum" fire, and which the Germans during the recent offensive in Flanders have designated as "hurricane" fire and "typhoon" fire. These designations give one some idea of the violence which artillery-fire can attain. In addition to the heavy artillery of great power, which is fired from emplacements, advantage has been taken of the opportunity presented by this type of warfare to use railroad artillery, enormous guns mounted on specially designed platform cars whose heavy projectiles fired at ranges as high as twenty miles have a very destructive effect.

As the defensive power of trenches—constantly strengthened and improved—continued to increase it became necessary to adopt some form of artillery which could drop projectiles into the trenches close at hand, so trench artillery consisting of mortars of different sizes was put in the first-line trenches. These mortars are able to hurl upon the enemy's trenches aerial torpedoes containing a great quantity of high explosive. Having but a short range, they are used only for the purpose of destroying the enemy's first lines.

The artillery has also made much use of what are known as "special" shells, these being shells

containing either lachrymatory or asphyxiating gases. They are fired especially against the enemy's artillery to prevent him from using his guns, but are also used to form a deadly barrage through which the hostile infantry cannot advance. These gas-shells explode with but a very slight report, and the sound of the explosion is the only warning that one has to prepare for a gas attack and adjust his mask.

The Germans, during the Ypres battle first launched an attack with gases and the use of asphyxiating and lachrymatory gases has since been very common. It was there used by opening special pipes which led to big reservoirs containing asphyxiating gases. This gas system is a very complicated one and can only be used in quiet sectors where it is possible to provide such a system. When everything is ready, clouds of gases are poured toward the enemy for several hours. The Germans launched such a gas attack in front of my regiment in May, 1916, but, fortunately, as we had thoroughly trained our men in the use of their gas-masks we sustained but few casualties. Most of the men who died in this way had not their masks with them and were not able to reach them. The masses of gas rolled very low. Two engineers who were working in saps in the front of my battalion had gone without their masks, or rather had put them in a dugout a short

distance away, and when the gases rolled in, one of these men conceived the idea of climbing to the top of a tree, with the result that he was not injured. The other one, who tried to run and find his mask, died before he could reach the dugout.

To avoid destruction artillery must be concealed. No longer can a battery fire in security from a position in rear of the crest of a hill, for the airplanes will locate it at once. To avoid destruction it must be screened from view of the enemy's aircraft, and "camouflage" is resorted to. This word means concealing, transforming or disguising, any object. Camouflage has become an art during the fighting of the past three years.

"*Barrage fire*," which has been adopted and perfected by the artillery since the cessation of open warfare, means simply a rain of shells on a certain designated zone. The British call it curtain fire, which well expresses the idea that a barrage is literally a screen of fire and steel placed between the foes, and through which the enemy cannot pass without being annihilated. When the barrage moves from line to line at regulated intervals to protect advancing infantry in the big drives it is called a creeping barrage. Trench warfare permits great quantities of shell to be transported and assembled in dumps, so that when the barrage fire is opened by the quick-firing modern guns

there may be available a plentiful supply of ammunition.

The engineers have had to play a very important rôle in this trench warfare, for the front is more like an immense fortress than a battle-field as we had imagined it in open warfare, and the laying out of defensive positions and arranging for their construction and repair has been a mighty task. In some parts of the front mine warfare has been carried on to a degree never before thought possible. Underground galleries are dug at the expense of much labor, great cavities underneath the strongholds of the enemy are packed with immense amounts of explosive, and when the fixed time arrives the mine is exploded, causing havoc to the foe and opening a crater in the surface of the earth at times to a depth of over ninety feet. What with mine warfare and the destruction wrought by the great guns of the artillery, there is utter devastation and ruin in that part of France over which the troops have battled.

The building and maintenance of lines of communication, including railroads of both standard and narrow gauge and roads of all kinds, has been another never-ending duty of the engineers.

The aviation branch of the service has been expanded and developed to a degree which is little short of marvellous. There has been a most remark-

able increase in the number of planes, and different types have had to be designed and constructed to meet the needs of airmen for fighting, bombing, artillery-observation, and reconnoissance.

Cavalry also has, of course, been affected by the change from open to trench warfare. Formerly it served as a screen, served as the eyes and ears of the infantry and prevented the enemy from obtaining information by its reconnoitring patrols, its chief purpose being to locate and destroy the enemy's cavalry. Now that both armies are behind lines of trenches, cavalry cannot be used as it was before, and therefore it serves in the trenches dismounted. If we assume that some day open warfare will be resumed, cavalry cannot be used with the weapons it had before, because the enemy's infantry has a much more powerful armament; and it has, therefore, been necessary to add new weapons to those heretofore carried by the horsemen. Cavalrymen are now equipped with bayonets, hand and rifle grenades, and automatic guns. There has also been quite a considerable increase in the number of machine-guns assigned to the mounted troops.

In the warfare of nowadays much depends on all units keeping in touch with each other. The word liaison covers all sorts of means of communication. Sound and visual signals, rockets, pigeons,

dogs, and runners are among the means of liaison which are employed.

Means of transportation have been greatly improved during this war. In open warfare the troops had to march. Now we employ for transportation a great quantity of trucks, and these offer advantages, as their use does not necessitate such great work as the construction of new railroads. During the Verdun battle all relief, the transportation of ammunition, supplies, and food, was assured by trucks running along a road which the French soldiers called the "Sacred Road." If it could not have been used it would have meant death for Verdun. That which most impressed me when, with my regiment, I was transported to Verdun on the 19th of June, 1916, was to see repairing parties at work continuously, day and night, along this road, on which there were two parallel streams of cars, one running upward toward Verdun and the other one from Verdun toward the interior of the country—the one bringing the troops to fight and repulse the Boche and the other bringing troops who had fought and were relieved and glad to go to rest-billets after doing their bit.

It is much easier to bring food to the troops who fight in the trenches than it is in open warfare, for the kitchens can be located rather close to the lines, and carrying parties are able to bring hot meals

to the men even in the first line. In open warfare this was not possible, because wagons had to be left at a distance on account of the nuisance which they occasioned on the roads. Therefore each squad had to do its own cooking—nowadays the cooking is done for the whole company. Thus we have less waste and the food is better cooked. As the troops do not move it was possible to arrange for huge food store-places and to supply troops whenever rations were wanted. Even if the supply-trains failed to arrive, these food stations had enough food to provide the fighting units for several days. In open warfare the constitution of such depots was not practicable because the armies moved several miles each day.

When an offensive is about to take place, the artillery-fire reaches such a pitch that all positions are destroyed and the ground is transformed into a field of shell-holes, which resembles the surface of the moon, and which is generally referred to as "moon terrain." This results in the trench warfare being changed to the shell-hole warfare, which is now the method of fighting on all offensive sectors on the Western front.

We have to train our men for the trench warfare which they must fight in relatively quiet sectors, and also for the shell-hole warfare for those sectors where either French or Germans have started an

offensive, as, for instance, at Verdun, on the Chemin des Dames, or in Flanders. The armies are huge masses of men who fight against each other—the French have nearly three million men in the field—but it would give a very false idea to imagine that on the first line large units fight under very strict command. That is not so; and more especially in shell-hole warfare men are allowed to use their own judgment, and there are small groups of only five or six men who co-operate and assist each other. These little groups have to fight alone, and it is only their good training and their sense of duty toward their country that enables them to hold the ground and fight in connection with the neighboring groups. The great masses are directed by the generals, but as we come closer to the enemy we notice that large units cannot be handled by their leaders and that it is very difficult in this warfare to transmit orders. In open warfare the men could see their chiefs, they could see how they led them. In shell-hole warfare that is not the case. Each man fights for himself but the efforts of all these men, fighting apparently in disorder, fighting apparently in no connection one with another, are directed toward the same aim—to overpower the Germans.

It is necessary that each small unit, that is to say, each platoon, should be able to fight by itself,

and so it is provided with the means, having all the armament which is required in this war, including hand and rifle grenades and automatic rifles. The platoon nucleus of the battle is a complete fighting unit in itself, being the largest group which one man is capable of actually leading and commanding in battle. Each weapon has its own special use and the platoon must be sufficient unto itself, capable of developing an intense fire by means of its automatic rifles, routing the enemy out of his hole by use of hand-grenades if the distance be short, or by the use of rifle-grenades if not close enough to use the former. The bayonet, the rifle-butt, and the trench-knife are for hand-to-hand encounters, for which the Germans have no great liking.

The training required by the present-day methods of warfare is different in many particulars from that for open warfare. For example, in open warfare we had no gas attacks. In this war it became necessary to teach each man of every branch the quick use of his gas-mask and the means of avoiding death by gases. In every army it was found essential to train specialists who could man the different weapons which had to be utilized, in order that injury might be inflicted upon the enemy wherever he might be.

It is, also, most necessary to train the different specialists to work together. One automatic rifle-

man does not fight for himself; bombers do not fight for themselves; but all fight together in close connection, and it is imperative, if we wish to obtain the maximum effect of our new material, to train our specialists for a long time in working together. This is not very easy, because it requires continued and patient training, and most of the time we do not stay at rest long enough to give this training. On this account it was deemed better to change the conditions of training. Formerly, when men had finished their training in the depots in the interior of the country, they were sent directly to the front in order to fill the gaps which were caused by losses. The results under that system were not very good, because the men, being generally recruits, were not accustomed to their entirely new life, and the units were not homogeneous. Nowadays the green recruit is trained in the interior of France. He gets there only a rough individual training. He learns how to shoot, how to use his bayonet, and how to throw grenades (but only dummy ones). Then he is sent to a depot at the rear of the lines. We have one of these depots for each army. There he is qualified, at least in his specialty. He is sent to schools—bombers' schools, automatic-rifle schools, machine-gun schools, and so on. Then he returns to his company at the depot and the recruits are again trained together. At

last they are sent to another depot in rear of the lines but nearer the front than before. There is one of these depots for each division, and the men are formed into a battalion for each regiment. They gain "esprit de corps" and learn to know the different leaders and to be proud of the battles fought by their regiment. At last they are sent to their regiment and join the units in the battalions which have sustained losses. They go there and are not strangers as they were formerly, for they know most of the officers and many of the men, they have been accustomed to hearing daily the sound of the guns pounding the trenches, and they have even been submitted to artillery-fire because they have been used as fatigue-parties, and have been obliged to dig trenches both at the rear and close to the positions occupied by their own regiment. The training is longer than was necessary before this new work. It is more detailed and brings the men into action gradually.

CHAPTER II

MACHINE-GUNS AND AUTOMATIC RIFLES

MACHINE-GUNS have been used to a very great extent during the war and all the belligerent armies have increased the number of these in the fighting units. The machine-guns in use in Europe are of several different types, with a rate of fire varying from two hundred and fifty to five hundred rounds per minute. Some types are operated by the force of the recoil resulting from the explosion, while in others gas is the operating force. The rapidity of action causes the barrels to become very hot and there must be some provision made for their cooling, otherwise the gun would soon be out of action.

The Germans use a Maxim machine-gun, which is water-cooled and of the barrel-recoil type. The jacket that surrounds the barrel forms a reservoir filled with water which is changed from time to time. Other types of guns are those used by the French, the Hotchkiss and the Saint-Etienne. They are cooled by air, and actuated by gases produced by the exploding cartridges.

Most machine-guns are rather heavy (the complete gun, *i. e.*, the gun itself with tripod, weighing more than fifty kilos) can only be fired when stationary, require a crew of several men to serve them, and when they are moved during action the men of the crew dismount them and carry the parts. They are most accurate, but require the determination of the exact range in order that the fire may be effective. The fire-power developed is very great. Ammunition has to be constantly supplied, and the transportation of this ammunition is not an easy problem.

The machine-guns are transported either on mules or on little carts dragged by a mule or a horse. They are used in pairs, two guns forming a platoon. If a long-continued fire is required only one gun of a platoon will fire so that the other may cool, but, of course, in cases of emergency the two guns would be used.

From a mechanical point of view these guns are rather complicated weapons. They have to be served by men who understand perfectly their construction and who are able to repair them in a very short time. A very slight accident will often prevent them from firing, but the expert men of the crew can make repairs or readjustments very rapidly. For firing, the guns are placed on a tripod which can be adjusted to different heights. When used

in the open the gun must be close to the ground, in order not to be detected, but when firing behind a parapet the tripod is usually extended to its full height. When used for fire against airplanes the gun is placed in an almost vertical position and makes a sort of barrage in trying to hit the plane. This use of the gun is only possible if a plane flies low, as machine-guns are not effective if the plane is much higher than a thousand yards.

The location of the machine-guns and their distribution depends on whether the action is offensive or defensive, and also on the configuration of the ground, but, in any event, there are two great principles which are always applied in the tactical use of machine-guns and which govern their emplacements, be it offensive or defensive. These are: *First*, that the machine-gun must act by surprise, and *second*, that it must be able to fire on the flank of the enemy, that is to say, in an enfilading position. The movements of a machine-gun must be made quickly and in secret, otherwise they will be reported to the enemy's artillery, their emplacements will be exactly located and a few shells disable them.

The fire-power of a machine-gun is so great, that, in a few seconds heavy losses can be caused in the enemy ranks, provided the gun is properly located. It must have a flanking position because of the ac-

Official photograph from British Pictorial Service

A BRITISH SOLDIER AT HIS POST CLEANING HIS LEWIS MACHINE GUN



curacy of the gun's fire, which results in the cone of dispersion being so narrow that if it is fired at the front of an enemy, in skirmish order, it will not cause great losses. If, on the contrary, the machine-gunners have selected a flanking position they are able to execute enfilading fire and whole lines of skirmishers fall in a few seconds. This staggers the enemy, shatters his morale, and obliges the succeeding waves to stop. The guns fire short and violent volleys, not being able to sustain great fire-power for long, and also because the targets do not remain under fire, having either been shot down or having crept under cover.

Machine-guns should be echeloned in depth, and since they can only fire when stationary, their stages of advance should be so calculated as always to have some machine-guns ready to open fire. In an offensive we generally divide our machine-guns, one part advancing waves to defend the conquered terrain and one part remaining in our first line, partly to check any movement of the enemy should our advance not be successful but more especially to form a creeping barrage in front of the assaulting waves and to counter-batter the enemy's machine-guns. Of course, these two groups will sometimes be called upon to relieve each other. For instance, the group advancing with the assaulting wave having stopped at a certain position might

be relieved by the group which has been kept in the first line, and thus advance farther into the enemy's lines.

As a rule, it is not considered good policy to put machine-guns in the first lines as they are quickly located by the enemy and so terribly shelled as to preclude the effective use of these weapons should the enemy attack. We sometimes advance our machine-guns to the first lines in order temporarily to protect these lines, which have been organized by infantry; they are, however, withdrawn to the rear as soon as possible and echeloned in depth.

On the defensive the guns are even more echeloned in depth and their emplacements carefully selected. Each machine-gunner knows where he is to fire should the enemy reach a particular point, and he also knows the exact range of each different point. On the defensive, machine-guns are concealed from the enemy's view by skilful camouflaging and great echelonning, which makes progress for the enemy both very slow and very costly, thus attaining the real object of a defensive, which is to gain time and shatter the front of an attack. The whole front of the defensive sector is completely covered by intersecting machine-gun fire, which is often sufficient to break any offensive planned by the enemy.

Machine-guns can execute indirect fire as do guns,

but it is rather a complicated task firing on an unseen target. For instance, being stationed behind a crest, a bullet fired over the crest may, because of its curved trajectory, strike some one stationed behind the crest. We know that if it is fired at a certain angle the bullet will attain a certain height and range, therefore, the first thing is to be sure the bullet won't strike the crest on its way toward the enemy. Usually, when we use indirect fire in the sectors we not only calculate accurately all the elements offered to that fire but also verify them by machine-gun fire in order to see that the barrage really is in front of the trenches we want to defend.

In defensive sectors we combine indirect with direct fire. Sometimes machine-guns take positions enabling them to fire over the heads of the infantry. During the battle of Champagne, in September, 1916, my battalion began the attack from a little slope, and was to storm a wood which was at the bottom of this valley. The machine-guns fired over the heads of my battalion and did very good work during the entire fight, as they remained stationary and fired during the whole time.

It is important to have the machine-guns moved as little as possible, as during the time of moving they are useless. The idea is for them to select positions enabling them to help the infantry by their fire as long as possible, and then to move to the

next position where they recommence. While they are moving other machine-guns should be held in readiness, so as to be able to help the infantry if necessary.

It is sometimes very easy, and sometimes very difficult, to control the effects of fire. When the ground is dry the bullets raise little clouds of dust which give a clear idea of where they have fallen; but when the ground is wet and damp it is much more difficult to see where the bullets fall. The platoon commander controls the fire, giving the range and making all the required corrections. The first requisite for good machine-gun fire is a good observation-post from which the enemy can be well seen; next to find the proper range; and finally to discover the best means of bringing up men and material to the firing position without attracting the attention of the enemy. It is better to take more time in preparing for the fire than to do it quickly and be seen by the enemy, in which case the machine-gun would never have a chance to go into action.

The automatic rifles are used in the French army and will be used by this country. They are neither machine-guns nor light machine-guns, but barrel-recoil weapons, scarcely heavier than ordinary rifles but having the advantage of being capable of being fired while walking, thus forming an excellent of-

fensive arm. A crew of three men is assigned to each automatic rifle, one man serving the gun and the other two carrying ammunition. They are used in the first assaulting waves, where the fire-power in the offensive is utilized. On the defensive, they are placed in the first lines, which are thus protected in front by heavy fire from these rifles and with intersecting fire by the machine-guns. In an offensive the first lines are enabled to hold their ground after having attained their objective in spite of counter-attacks.

The auto rifles work well with the bombers, because, if the enemy hides in shell-holes or trenches in order to avoid the automatic-rifle fire, the bombers can come within good range for grenade-throwing. If, on the other hand, the enemy should try to prevent our bombers from throwing grenades the automatic rifles would cause great havoc among them, as they would be obliged to show themselves in order to take proper aim.

This gun sometimes has stop-jams, but the man who serves it must be able to put it into good condition again. It is less visible than a machine-gun and can, therefore, be brought much closer to the enemy without his being aware of its presence, and the riflemen have greater facilities for moving their guns as they are lighter and more portable. My regiment first used them during the Verdun

battle, and in the Somme and in the Aisne offensives.

Night fire by either machine-guns or automatic rifles is not very effective because it is impossible to discern the target, although if a sector has been in our hands for some time, fire at night might prove very effective, as barrages of machine-gun fire and automatic-rifle fire can be dropped on certain areas where the enemy is reported to be, as well as in the front of others in order to prevent his gaining a foothold in our line. In February, 1917, the Germans tried to raid my battalion front near Verneuil. In preparation for this they executed drum fire over the front they intended to raid. During this time the machine-guns of the defensive fired a volley a minute, thus keeping the front of the battalion constantly covered by machine-gun fire. When they extended their range in order to allow the infantry to enter our lines, all the machine-guns started firing, without order, at top speed, and created such a terrific fire that the enemy did not even attempt to enter our trenches, and regained his own as quickly as possible. This was done during a heavy fog at four o'clock in the morning, so that it was nearly as dark as at night, and the machine-gunners had to fire without seeing their targets. Nevertheless, they knew exactly at what range and in what direction to open the curtain of fire.

The training of both machine-gunners and automatic-rifle men takes a very long time, especially that of the first gunner. They should be strong and gallant soldiers, trained to carry heavy loads long distances and over furrowed ground. They must be perfectly familiar with the different parts of their guns, and must be able to mount or dismount them correctly without even looking at them. They must learn to mount their guns in the dark; must be taught to fire properly, and, finally, must learn to work harmoniously as a team. With this training they will be able to do well on the stand, but will still have to be trained from a tactical point of view. This includes the training of the platoon and then the company, both for defensive and offensive action, and the training in connection with the infantry, their organizations being a part of the infantry and giving it valuable assistance, but being unable to work without it. It would be a gross mistake to fancy that machine-guns can take the place of guns. They have not at all the same objective. They are arms with small and medium range. The training of the machine-gunners will be a very long one, because they must learn to act independently and to show great initiative. They are not equipped as are the rest of the infantry. They carry their blankets in the individual shelter-tent across the body, and inside this roll

they carry their rations. They do not carry a full pack like the infantry, because that would make it difficult to carry a machine-gun.

A great problem is that of supplying ammunition. Special dumps should be provided, and during the offensive the gunners must know to which dump they have to go to bring ammunition to their guns. These dumps are advanced according to the advance of troops. Each platoon carries a certain number of boxes of ammunition. When on the defensive, depots are arranged where there is plenty of ammunition.

The training of auto-rifle men is different, because they do not form special companies like the machine-gunners, but form part of the infantry company. Their training takes rather a long time, because the management and care of an auto rifle is more difficult than that of an ordinary rifle; besides which they require the same training as do other riflemen to become good marksmen. Another difficult thing is to teach them how to fire while advancing, and this requires long and continued practice. One difficulty lies in the fact that when any stoppage occurs they have a tendency to stop and repair it, thus checking the advance of the whole wave. They must learn to repair their rifles while marching, which is not easy. The moral effect of several teams advancing while firing is very great,

for they are able to pour a rain of bullets over the parapets or the ridges of the position held by the enemy, thus preventing him from observing what is going on. These automatic rifles make the same noise and have the same rattle as machine-guns, which adds to their great moral effect. Auto-rifle fire is not as accurate as machine-gun fire, but is just as accurate if not more so as the fire of an ordinary rifle.

The British and the Germans use light machine-guns. Those of the British are called Lewis guns. These Lewis guns are not to be confounded with automatic rifles. As machine-guns they cannot be used for the purpose of increasing the fire-power in marching, and can only be fired from a mount. They therefore only attain their full efficiency after the wave has stopped advancing.

The rifles form the main armament of infantry companies. Nearly every infantryman is armed with a rifle, even though he may be a specialist, because his specialty will often be of no use and he will have to do his bit as an ordinary rifleman. For instance, the bomber may have thrown all his grenades, and should he have no rifle he would be defenseless and useless; but if he has his rifle he will continue to fight with it and with his bayonet.

The training of a rifleman consists in teaching him first how to use a rifle, that is to say, to become a

crack shot in a stand. Then he will be taught the tactical use of his weapon, and, finally, the whole platoon will be trained in the use of infantry fire. Individual training should teach a private the perfect use and handling of his rifle—how to keep it in perfect condition and how to dismount and replace the different parts correctly. He must be taught how to load, to take fire, and what is the correct posture. All this must be taught with blank or dummy cartridges before the man is taken on the stand, and there made to apply the principles he has learned.

But all this will only make a good shot from a stand and will not develop the abilities required on the field under conditions differing widely from those of a stand. The man must be taught to handle his rifle under conditions as similar as possible to those on the field; he must be able to fire, no matter under what conditions, and in any position; the target may be a very fugitive one and he must remain steady, because, unless he gets the enemy, the enemy will get him. He must be able to fire after having run (which will nearly always be the case, as skirmishers make a rush and then take cover), and he must be able to fire in order to allow other skirmishers to proceed. This forces the enemy to take cover during a few seconds and allows them to use the bayonet. It is the fire which permits a new

rush to be made, and unless superiority of fire is obtained, it is impossible to advance, as the losses would soon be staggering.

The superiority of fire referred to above can be an artillery superiority. It need not be a superiority of infantry fire. As a matter of fact, everything referred to above usually applies only in open warfare as it was fought before trenches were dug all along the front. Since trench warfare was established, in all the assaults my regiment delivered the men never had to fire during the assault, that is to say, during the time they stayed in No Man's Land or in the Germans' positions. They only had to fire after having carried the enemy's positions, when the Germans counter-attacked them, or, if they had to fire before then, the advance was checked and they had to intrench themselves where they were.

Superiority of fire is much more easily obtained by the artillery, which devastates the position and opens the way to the infantry, which submerges it and, after having mastered all local resistance, occupies it. The assault is merely an occupation of the ground where local resistance is to be overcome, but rifles will only come into play when the infantry has to maintain its gains against enemy counter-attacks intended to drive the enemy back to his own trenches. The French use the Lebel

rifle, which is one of the oldest in use among the belligerents, but which has rendered very good service. It is longer than the German rifle, so that with the bayonet fixed, we have a marked advantage in bayonet fighting.

Pistols are used by all the officers and by a certain number of privates (especially bombers), who have them in addition to rifles. In hand-to-hand combat in trenches they are very handy weapons and are of great use to "mopping-up" parties. Pistol training should be similar to that of the rifleman; first develop a stand marksman and then convert him into a fighter capable of using his weapon in every circumstance of the fight. Only automatic pistols are now in use.

CHAPTER III

HAND AND RIFLE GRENADES, THE ONE-POUNDER GUN, TRENCH MORTARS, BAYONETS, AND TRENCH KNIVES

DURING this war, hand and rifle grenades have been a most valuable part of the infantry armament. These weapons are not, as it is commonly thought, an innovation in warfare. Grenades were first used during the reign of King Francis I of France, in 1510, and the Russians and the Japanese used them in the Russo-Japanese War. When the war broke out in 1914, we had a supply of hand-grenades, but only the engineers were trained in their use, for we believed that they should only be used in besieging a stronghold. But is not the entire front a stronghold? After the battle of the Marne, both Germans and French occupied trenches separated by only a few yards, which made it impossible to go "over the top," because each was mowed down by the enemy's fire. Our artillery was not powerful enough to silence the Boches, and as we were not able to kill them with our rifles, we had to devise some new means of fighting. In some

sectors the troops hurled stones at each other, but very soon the men constructed a sort of grenade made of tin ration-boxes, which they loaded with explosives, nails, and glass, using Bickford fuses to fire them. These were the first grenades our men used in the trenches, and they were used to a great extent in my regiment in front of the Tranchée de Calonne, south of Verdun. By 1915 we were furnished with an ample supply of hand-grenades.

The defensive hand-grenade is about the shape and the size of a large lemon and contains a bursting charge of explosives, weighing about twenty-two ounces. For offensive use the grenades had to be made in a different manner from those which were intended for defensive purposes. Being on the defensive, it was necessary to have a grenade which, when bursting, not only injured the enemy with the explosive which it contained but also with the many fragments of the grenade. These fragments flew in every direction, and it was necessary to be sheltered in order to throw such grenades without danger to the thrower, as the radius of action is greater than the distance to which the grenade can be thrown.

When a man is in the open he must have another type of grenade so as to injure the enemy and not himself. Grenades bursting into fragments cannot be used. The offensive grenades contain a much

greater quantity of explosive than the defensive ones, but do not break up into flying fragments, as the case is made of tin. Defensive grenades are made of cast iron and are corrugated horizontally and vertically so that the explosion will burst the case into a great number of pieces—about 120 for each grenade. These fragments are dangerous to a distance of, at least, 100 to 200 yards, and on one occasion I saw an officer wounded by a piece of a grenade which exploded at a distance of over 200 yards; but this is rather an exceptional case. The fragments are ragged and cause very painful wounds, as the cast iron penetrates and tears, and the explosive generally burns the flesh. In each grenade there is a Bickford fuse communicating with a fulminating capsule which sets fire to the explosive. There is always a safety system in order to prevent accidents; generally a pin holds a lever and prevents it from lifting. When this pin is taken off and the grenade is hurled, the lever lifts automatically, sets fire to the fuse, which burns during five seconds, and which then sets fire to the bursting charge. These weapons must be handled very carefully, because if they should be treated roughly the safety-pin might fall and thus cause one grenade to explode, and also all the neighboring ones.

The manner of throwing a grenade is a very important part in the training of bombers. Many

Americans think that because they are good baseball-players they will throw grenades well. This is only partly true, because if they throw a grenade as they throw a baseball, they will not accomplish the results which are desired. The grenade is to be thrown like a cricket-ball for the following reasons: (1) By hurling a grenade in this way we have a curved trajectory, and thus are able to catch an enemy concealed either in a trench or in a shell-hole. A grenade thrown as a baseball has a comparatively straight trajectory and will not reach the enemy concealed in a hole or in a trench; and, moreover, every obstacle will stop the grenade in its flight. (2) A grenade thrown by the French method stays a longer time in the air than when hurled in another way. It must be borne in mind that the grenade fuses five seconds before it explodes. If it drops after one or two seconds the enemy has three seconds to catch it and hurl it back at the thrower. This was done a great many times in the beginning of the trench warfare. (3) The French method is not tiresome, so each man can throw a great many grenades, and as grenade fighting requires the throwing of hundreds and thousands of grenades, if the thrower does not adopt an easy, strength-saving motion, he will very soon get a "glass" arm. Besides, the man throwing the grenade after the manner of a baseball-player takes

many chances of hurting his hand severely against the parados of the trench, which may cause him to drop the grenade in the trench and injure his comrades and himself. The method used both by French and British is the following: In the standing position the man takes aim with the extended left arm, and, holding the grenade in the right hand, he brings his extended right arm forward until the hands are together; then swings the right arm back and down whilst looking to see that nothing interferes. He then hurls his grenade along the same plane as that of his left arm, adding great power by the movement of his body in the throwing position, the right hand coming up directly over the head. Before throwing, the left leg is straight and the right knee bent, but as the grenade is hurled, the thrower straightens the right leg and bends the left leg at the knee. Thus all the parts of the body assist in the throwing of the grenade, which is not exhausting. We have had bombers who were able to hurl hundreds of grenades without becoming tired.

The first important point in the training of bombers is to select men of the right temperament. Bombers ought to be most courageous men who are able to throw a good distance—at least thirty yards; but most of the throwers should be able to reach forty and forty-five yards. The captain

selects from among his men those who are the most daring, who practise hurling dummy grenades. He then selects those who hurl them from the longest range, and these receive training as bombers. They must be able to throw at a long range and to throw accurately. These two parts of the training ought to be taught at the same time. The bombers are taken out in the open, targets are made by marking out lines of white tape, the nearest being at a distance of fifteen yards, and others five yards apart. The bombers throw their bombs first at the fifteen-yard line and then gradually increase their range. To make them throw accurately, the first white lines will be called trenches, then listening-posts. To strike the latter is more difficult, because listening-posts are not as broad as an ordinary trench and they are also short. Lastly, the throwers practise hurling grenades into a shell-hole. This is still more difficult on account of the peculiar form of these craters. The bomb must not strike on one of the edges of the crater, but must fall directly inside. The training should not be conducted the whole time with dummy grenades, because the men will get accustomed to dummy grenades, and when they come to throwing live ones, will handle them awkwardly, being unaccustomed to them and to the noise they make.

After this first instruction the grenadier is able

to throw hand-grenades accurately at a sufficient distance, but he is not yet prepared for fighting purposes. He must now be trained from the tactical point of view, and must be taught how to fight in trenches and in shell-holes. When in trenches he must know how to throw grenades while protected by a traverse, and how to proceed to the next traverse. In shell-hole warfare he must know how, and be able, to throw his grenade accurately into the shell-hole into which he intends to leap. The bomber must also be taught how to adjust his equipment when carrying grenades. This is very important, because if not equipped properly the hand-grenades might explode or, at any rate, might be a great hinderance to him while crawling in No Man's Land. After having been taught how to equip himself, he will be taught how to crawl in No Man's Land, *i. e.*, to creep over the ground by the use of elbows and knees; how to pass barbed-wire entanglements, and how to throw grenades while kneeling and while prone.

It would seem that bombers, being individually well trained, would do good team-work, but this is not the case. I remember in February, 1915, assembling ten bombers who, individually, were able to throw grenades at a distance of from forty to forty-five yards; but when hurling them together as a body they only threw at an average distance of from

twenty-eight to thirty yards. This may be explained by the fact that each bomber was afraid that his comrades would not throw the bombs properly, and paid more attention to his neighbors than to the throwing of his own grenade. Thus it is necessary to proceed with the training of the whole team in the same manner as with that of the individual soldier.

Each bombing squad is composed of a corporal in command, two throwers, two carriers, two riflemen, or scouts, and one reserve. Each of these men has a particular duty to perform. The corporal commands the whole team and directs the fire of his throwers. These, as the name indicates, throw the grenades and have next to them a carrier, who constantly provides them with fresh grenades. The thrower would be defenseless if he were to meet a German at close range, because the adversary could fire at him before he could throw his grenade and before the grenade would explode, for it must always be remembered that it requires five seconds for the grenade to explode after being thrown. So the thrower is protected by an ordinary rifleman acting as a scout. These men must be well trained in the use of the bayonet. The scout is always ahead of the thrower, prevents the Germans from coming to close range, and reports the results of the fire of grenades.

The squad being formed, each man is taught to handle and throw grenades, because each of them must be able to take the place of any one of the team. The training is the same as that of the actual thrower, both as to long range and accuracy. Then the whole squad is trained in team-work in the trenches and in shell-hole warfare, either on the defensive or on the offensive. In trenches on the offensive, the team has to precede into communication-trenches and drive away all Germans who may be occupying these trenches. The scout is ahead, at least one traverse in front of the thrower. Behind the thrower comes the carrier and the corporal. Another traverse behind, a second group is formed of the other thrower, his carrier, scout, and the reserve man. These two groups are separated, so that a grenade exploding near the first group will not injure the second one. The thrower hurls his grenades over the head of his scout, who reports whether the range is correct, and who then proceeds to the next bay of the trench to ascertain whether any Germans are there. The thrower, carrier, and the corporal reach the traverse which their scout has just left, the second group also makes another advance, and thus the whole team proceeds from one bay to another. They must be very careful, in order to avoid traps laid by the Germans. If a greater fire-power is required, the corporal orders

the two throwers to accompany each other. If another trench is encountered leading off from the trench in which the team works, one of the throwers, his carrier, and the scout should proceed up this other trench in order to prevent any German counter-attack on the flank of the team.

Bombers are always used for cleaning up the trenches during an attack. They take possession of the entries to the dugouts, and thus compel the German garrison to surrender. If the enemy offers resistance, then bombs are hurled inside the dugouts, incendiary grenades and asphyxiating grenades generally being used for this purpose, thus compelling the Boches to surrender. The cleaners-up are not allowed to leave the entrance of a dugout in a trench to which they are assigned without first ascertaining that no German is still alive in this dugout. These cleaners-up must be men who are strong and cold-blooded. Sometimes they have a very hard and arduous task. In the last offensive which my regiment made on the Chemin des Dames, a dugout which contained four hundred Germans was taken only after a siege of two days.

In the defensive, the bombers must be able to throw a great quantity of grenades in a very short time, forming a defensive barrage in front of the assaulting troops, and I can assure you that the fire effect produced by this kind of barrage is very great.

If the bombers have time and an ample supply of grenades, it is quite impossible to cross such a barrage.

The bombers are also taught to make barricades. These are a sort of wall built out of sand-bags in which loopholes are placed. They are erected whenever the team stops in the trench which thus belongs both to Germans and French, and are placed at the bend of a trench in order to get the greatest possible range. The barricades form a sort of listening-post, a second wall of sand-bags being placed behind the first one at a distance of about four or five yards. This is done in order to prevent a grenade which explodes behind the first barricade from hurting the occupants of the listening-post. It is a difficult task for the German bomber to throw a grenade into such a listening-post, composed of two walls of sand-bags, as he cannot approach to short range without being shot down by the riflemen who are firing through the loopholes. He is obliged to throw his grenade from behind a bend of the trench or from behind a traverse. Then the throwers who are in the listening-post will also hurl grenades, and if the enemy does not succeed in getting his grenade between the two sand-bag walls, no fragment will hurt the French bomber.

In shell-hole warfare the bombers proceed in single file, each man leaping from one shell-hole

to another, the scout always in front of the thrower and his carrier. The thrower hurls his grenade over the head of the scout into a shell-hole, then the scout leaps into the shell-hole where this grenade has just exploded, and with his bayonet takes care of any uninjured enemy who may have escaped the effects of the bomb. Both carrier and thrower then proceed to the shell-hole which the scout has just left. This same method is repeated at each shell-hole, and in a very short time great areas of shell-holes are cleaned up. When my battalion was in the Verdun battle (June, 1916), the regiment on our left was hurled back with severe losses, leaving a gap of about 2,000 yards between the two regiments. The Germans succeeded in getting into this gap, which placed us in a very critical position, because the enemy could turn the flank of our regiment and compel us to retreat. In fact, a party of Germans succeeded in getting close to the colonel's commanding post on the night of the 22d of June. But next day parties of our bombers proceeded from shell-hole to shell-hole, and succeeded in driving out the Germans. The advice to bombers should be: "Throw your grenades at a greater range than the enemy, and throw more than he does."

Bombers are also used in big offensives when all the troops go over the top in the so-called "wave"

formation. They are placed in one line and proceed with their comrades, being always in the first line of their platoon. Their duty is to hurl grenades into the shell-holes which could be transformed into sectors of resistance. They work in close co-operation with other specialists, chiefly the automatic riflemen. Automatic rifles and grenades are the complement of each other. This sort of fighting necessitates the consumption of a great amount of grenades, and in some special cases thousands of grenades have been hurled at such a time. A very striking example of this was given in May, 1917, by a bombing team on the Mont Cornillet. A regiment had been ordered to storm this position, which was a very valuable observation-point, but the Germans sent a party of fifty bombers, who succeeded in driving back the French regiment from the crest. The colonel commanding the regiment asked for reinforcements, and ten selected bombers of the Bombers Army School were sent to him. These succeeded in killing some of the German bombers in the first volley. As they outranged them, after a hot fight of nearly two hours, the Germans were compelled to fall back and seek shelter in their dugouts, where they were presently captured. In this fight the French bombers used about 10,000 grenades.

What results can be obtained by hand-grenade

fighting? Can it be used in open warfare? With bombers only, we cannot hope to start great operations. They prove very useful in making raids, in hurling volleys of grenades, in surprise attacks, in cleaning up trenches, and returning to their own trenches with prisoners; but it would be a mistake to think that by bombers alone we could secure success. Bombers form a part of the platoon and are only useful if they are employed in connection with the other specialists, and more especially with the automatic-rifle men. Sometimes, in big offensives, special detachments, composed of bombers and automatic-rifle men, were formed in front of assaulting waves in order to ascertain whether the artillery had done its work and whether the enemy's infantry was unable to offer resistance. The automatic-rifle men had a strong fire-power, and the bombers, with their grenades, could dislodge the enemy concealed in the trenches. If, on the other hand, the enemy showed fight, these detachments were able to cling to the ground, and the artillery preparation would be resumed. Bombers alone may also be employed in some special cases of open warfare, especially in fighting in villages or towns. An enemy concealed in houses or in caves can with a very small garrison stop and cause heavy casualties to the assailant. Our regulations say that such strongholds are to be attacked on both

flanks; nevertheless, it will be necessary to occupy them, to actually take them, and it would seem that bombers could do good work, the throwers being protected by the scouts, who would fire on any enemy who appeared while the grenades were being hurled into the caves and houses. Bombers could also be used in special cases of open warfare, namely, in fighting in open woods.

The rifle-grenade is inserted into a discharger, shaped like a truncated cone (called, in French, "Tromblon"), which is fixed upon the muzzle of the rifle. The rifle is then fired, the bullet passing through a hole in the centre of the grenade, which is pushed forward by the force of the gas from the cartridge. As the bullet passes through the grenade it strikes the primer, which ignites the fuse. This is called the "VB" grenade, from the initials of the man who invented it (Vivien Bessières). Its range is from two hundred to five hundred yards. It is very convenient, because the rifle-bombers use the same rifles and rifle ammunition as ordinary riflemen. If they have no rifle-grenades, then they fight as riflemen. They are generally placed in the second line, the grenades, when required, being fired over the heads of the men of the first line. Rifle-grenades are also employed in grenade fighting, and are fired also over the heads of the hand-bombers. The great difficulty lies in keeping the

rifle-grenadiers supplied with ammunition, for the grenades are rather heavy, weighing over a pound. But they are very useful on the defensive, in making a barrage at a greater distance than the hand-grenade barrage, and they are also used for the purpose of harassing the enemy by keeping his trenches and communication-trenches under fire.

The 37-millimetre gun is called the "accompanying gun," that is to say, it always follows the infantry and forms a part of the armament of modern infantry. Firing a projectile weighing about a pound, it is also called the one-pounder gun. Each battalion in the French army has one of these little guns, which is ordinarily mounted on wheels and pulled by a mule, but when in action it is dragged by the gun crew. When it is placed in battery the wheels are taken off. It can be dismounted and transported in the same manner as a machine-gun, and is used for the purpose of destroying machine-guns, in which purpose it is most successful. It has a range of over twenty-five hundred yards, but is generally used at a distance of about nine hundred yards, which is the best range for it. It is extremely accurate and quick-firing, firing about twenty rounds per minute. In my battalion we made good use of it on the Chemin des Dames, where we succeeded in displacing several German machine-guns which were pouring a deadly fire on us from a place called

Froidemont Farm. The great difficulty in using this gun is the fact that if the enemy locates it, their machine-guns will be able to shoot down the crew before it can fire a single shot. Consequently, it is necessary either to be able to open fire before the enemy's machine-gunners or to select a position concealed from the enemy's view. The latter is generally done, as in offensives we are unable to locate the machine-gun nests before they fire upon our assaulting troops.

The light trench mortar, which has an effective range of from three to five hundred yards, is an infantry weapon, served by infantrymen. There are a number of different models, some of which are pneumatic guns. The projectile is a bomb which explodes on impact, and because of the low velocity, the trajectory is very curved. Like hand and rifle grenades the work of this mortar is to reach the enemy concealed in trenches, and it is very useful in harassing the foe and in forming barrages. The calibre is about three inches, and while it is a most effective weapon against personnel, it is not powerful enough to destroy works. These light mortars are placed in the front-line trenches; they are very accurate and can be fired very rapidly. At times seven projectiles from the same gun can be seen in the air at once. Owing to the ease with which they are transported, these weapons may

accompany troops on the offensive, being dismounted and the parts carried by the men of the mortar detachment.

Each man now carries an intrenching-tool. They form a part of the regular equipment, and a most important one, indeed. The infantry may fight at times, but it always digs! It has been said that Napoleon won many victories "with the feet of his soldiers." It can be said that the French generals have won many victories with the shovels and picks of their men! These intrenching-tools are used for the purpose of making rifle-pits, and also for working in the trenches. If quick work is required, then these tools are not sufficient, and larger tools are necessary. These latter are transported in the regimental trains and are also carried by the engineers. We have a great supply of them in the local dumps. They consist mainly of picks and shovels, but include also some destruction-tools, such as axes and saws.

The infantryman is provided with a bayonet, but people are wrong in thinking that enemies often engage with the bayonet during a fight. Many persons imagine that units, such as platoons headed by gallant leaders, encounter each other and begin a bloody hand-to-hand fight. This never occurs. Sometimes, and this is rather seldom, individuals fight with bayonets, but, as a rule, if the assaulting

troops who advance with fixed bayonets succeed in reaching the enemy's trench, the enemy does not fight with the bayonet. In open warfare, also, bayonet combats are rare, though after the battle of the Marne many men were killed in bayonet fighting. I have never seen a bayonet fight myself, though I was on the front for a little more than two years and a half, and took part in all the big French offensives. The only fight which could be considered in this way happened in August, 1914. At eight o'clock at night (on the 24th) my battalion was ordered to storm a farm occupied by the Germans. I commanded the vanguard. It was pitch-dark, and when we got near to this farm the Germans poured a shower of bullets at us, though with slight effect. On we rushed and entered the farm—no Germans to be found! They had left as soon as they saw that we were not to be stopped. Grenade fighting has now taken the place of the former bayonet fighting. However, it would be a gross mistake not to train the men in the latter, for they may some time have a chance to use their bayonet. It is also very valuable to them to have an idea of the bayonet fighting, in order that they may not fear the fierce hand-to-hand fighting so much.

The nations using the different arms have different-shaped bayonets, the British and American ones being heavy and short. The Germans have

a bayonet of about the same size as the English, but one edge of the blade is a saw, which, however, is not used in hand-to-hand fighting, as some people think, but for the purpose of cutting trees. The French bayonet is much longer than that of the other armies, and it has a triangular point. It is more like a long heavy needle than an ordinary bayonet. It inflicts vicious wounds, because the wound closes upon itself, and the enemy bleeds to death internally. The French rifle is also much longer than the German, and that is one reason why the enemy never wants to fight with the bayonet against the French, for he would be at a disadvantage most of the time. When a Frenchman nears a German the latter fires from a short distance. This is why in the training in bayonet fighting it is necessary to teach the men to fire before hitting the enemy.

The bayonet drill is a very simple one. The men are taught to be nimble and agile, to parry and to make thrusts at their opponents. This training is done in special places prepared for this purpose. The men have in front of them dummy Germans, and are taught how to hit the enemy and also how to pull the bayonet out after having driven it into him. (This last is a very important point, because sometimes it is difficult to extract the bayonet, especially when it comes in contact with the

bones. Often the best way to get it out is to fire the rifle.) A cross-country course is laid out and the soldiers have to jump over fences, through barbed-wire entanglements, run through trenches, cross little woods, and on the way they always find dummies which they are to bayonet. This is done in order to train the minds of the men to work quickly and to teach the soldiers to use their arms under any conditions.

Trench knives have been used only since trench warfare began, and are given more especially to the "moppers-up" for cleaning up the trenches. This became necessary because the bayonet fixed upon the rifle proved awkward in narrow dugouts. It is also the complement of the grenade. The grenade is employed for the more distant work, and then the knife is used in the close fighting. These trench knives are of different forms but are usually made like daggers.

CHAPTER IV

THE ARTILLERY

THE rôle of artillery has assumed greater importance than ever, as a consequence of trench and shell-hole warfare. The work of the artillery in the early period of the war was to prepare for the assault of infantry and, by so doing, to render the advance march possible. Under cover of very powerful bursts of artillery-fire, infantry was able to advance and reach a point some five or six hundred yards from the enemy. Then all the artillery would concentrate its fire against the enemy's position, and the infantry would have to storm it. In the warfare of to-day the rôle of the artillery is quite a different one. Artillery must be able to help infantry before, during, and after the assault. This can only be accomplished by possessing excellent observation-posts, knowing exactly the positions which the enemy and our own troops occupy, and having the correct range. In one word, it is necessary that both opponents be face to face for a certain time. The expenditure of shells has increased enormously on account of the greater part which

artillery plays in the battle. In fact, artillery devastates the position and opens the way to the infantry which occupies and holds it. The artillery renders the conquest of the position by the infantry possible and they keep it, even if the enemy counter-attacks in an effort to regain the lost ground.

In artillery we must distinguish between the functions of the guns and those of the howitzers. The former have a very flat trajectory; the howitzers have a curved one, being able to reach an enemy concealed behind cover. Howitzers are used in open warfare when the enemy is in the rear of a crest, but in trench warfare their fire has numerous applications. We divide artillery into (1) field-artillery; (2) heavy artillery; (3) heavy artillery of great power; (4) railroad artillery, and (5) trench artillery. All of these have different uses and all are required in a battle to-day. The different guns and howitzers have a special brake which enables the gun to return to its former position after the shot is fired. If such brakes did not exist, the recoil would carry the gun backward, and after each shot the gunners would be obliged to put their guns in the position which they had before the shot was fired, which would, of course, result in the rate of fire being much slower. The guns send shells. These shells are generally put in a sort of cartridge con-

taining a certain amount of powder. When the gun fires, the gas produced by the deflagration of the powder hurls the shell forward. The shell itself is a case of steel containing either high explosives and a fuse or high explosives and small round bullets with a fuse also. The fuse can be timed in such a manner that the moment the shell hits the ground it explodes. Or the fuse can also be so constructed that the shell explodes after a certain length of time—that is to say, either during its flight in the air or within a certain time after it has hit the ground; for instance, one or two seconds afterward. The shells which contain bullets are called "shrapnel," from the name of the man who invented them. They must explode over the head of the enemy (not too high), so that all the bullets and the different parts of the steel casing will produce their effect. On the other hand, those shells which only explode within a certain length of time after they have reached the ground are called "shells with retarded fuses." They prove very useful for the demolition of dugouts, because they penetrate some distance into the ground, and explode either inside of the dugout or in its vicinity. If the dugout is not entirely destroyed, the force of the explosion will shake it so much, will cause such a displacement of air, that the whole dugout will collapse.

Artillery has been obliged to make different fires, which have received quite different names. These names, usually, are descriptive of the effect of the fire. For instance, the words "curtain fire," or "barrage" (which is a French term), indicate that the fire forms a sort of screen, a kind of curtain produced by exploding shells, which is placed between the opponents. Very often, in the official communications, it is stated that the curtain fire or the artillery-fire turned into a drum fire. The Germans first used that expression, speaking of "Trommelfeuer," that is to say, that the shelling was so intense that it could be compared to the rattling of the drum. Lately they have named it "hurricane" or "typhoon" fire, thus describing the greater violence which is attained by this fire. Another expression is "raking fire," meaning that the shells so rake a space of ground that every inch of it is covered several times by shells or splinters, rendering it useless to the enemy as a means of resistance. We have also "encaging" or "box" fire. This fire, as the name implies, is one which places the enemy in a cage or a box of fire, and prevents him from running away either on the right or on the left flank. There is also the "bothering fire," the "harassing fire," the "sprinkling fire," with its object to sprinkle the enemy with shells, the "combing fire," and the "retailing fire." One of the most important

fires is the "destroying fire," which has as its object the melting away, in a very short time, of all the enemy's organization.

The artillery is the principal aid of infantry. It cannot do its work without the infantry, but the infantry can lead the fight without the assistance of the artillery. The artillery, to be able to fulfil its mission, must be in close connection with the infantry and must be able to see and study the effect of its fire. This connection between infantry and artillery is assured by the ordinary means of liaison and by frequent meetings between the artillery and infantry officers. The infantry signals to the artillery by rockets and also by the inter-mediation of planes. The artillery is now placed in such a way that the ground of the field of battle can be divided into a certain number of zones, to each one of which is allotted an equal number of guns, so that everywhere the fire-power could be equal. This could not be done with a system of infantry defense, to be distributed around a certain number of points or strongholds. We are obliged to fight and beat the enemy down, in order to conduct great concentration of fire on chosen areas. By this method large gaps are formed in the enemy's line, gaps through which the infantry rushes on and carries away all the rest of the enemy's positions, just as in a dam with a certain number of holes;

the water rushes through these holes, and very soon the dam is carried away.

We shall, in this chapter, review the different kinds of artillery and see how each works, thus getting a general idea of how great masses of artillery are used in each moment of the battle.

First, the field-artillery, which is a very large branch. The fire of this field-artillery has a very strong effect against men, but being of rather small calibre, its effect is not very great against material. Our 75-millimetre gun works splendidly against columns but is not so good against trenches and dugouts, which it is unable to destroy, proving very useful, however, for the destruction of barbed wire. It is a quick-firing gun, destroying effectively in a very short time, by hurling such a great number of shells that the enemy has no time to get out of the fray. Successful against men, it is always to be found in a barrage fire, be it the ordinary barrage, which is lowered when the enemy tries to attack our trenches, in order to form in front of them a zone which he can't cross, or the "creeping" barrage—that is to say, a barrage which moves along, creeping in front of advancing infantry, the object of which is to kill every enemy trying to come out of his dugout. This gun is also used when it is desired to place under fire the enemy's columns or reinforcements which are at a more or less great

distance. As it is very accurate, we get the proper range in a very short time, and the destructive fire may be begun. Of course, it is absolutely necessary that observers should observe, direct, and control the fire of the battery. The 75-millimetre is also used as anti-aircraft guns, the fire forming a sort of barrage in the air, in order to prevent the enemy from crossing certain prohibited zones.

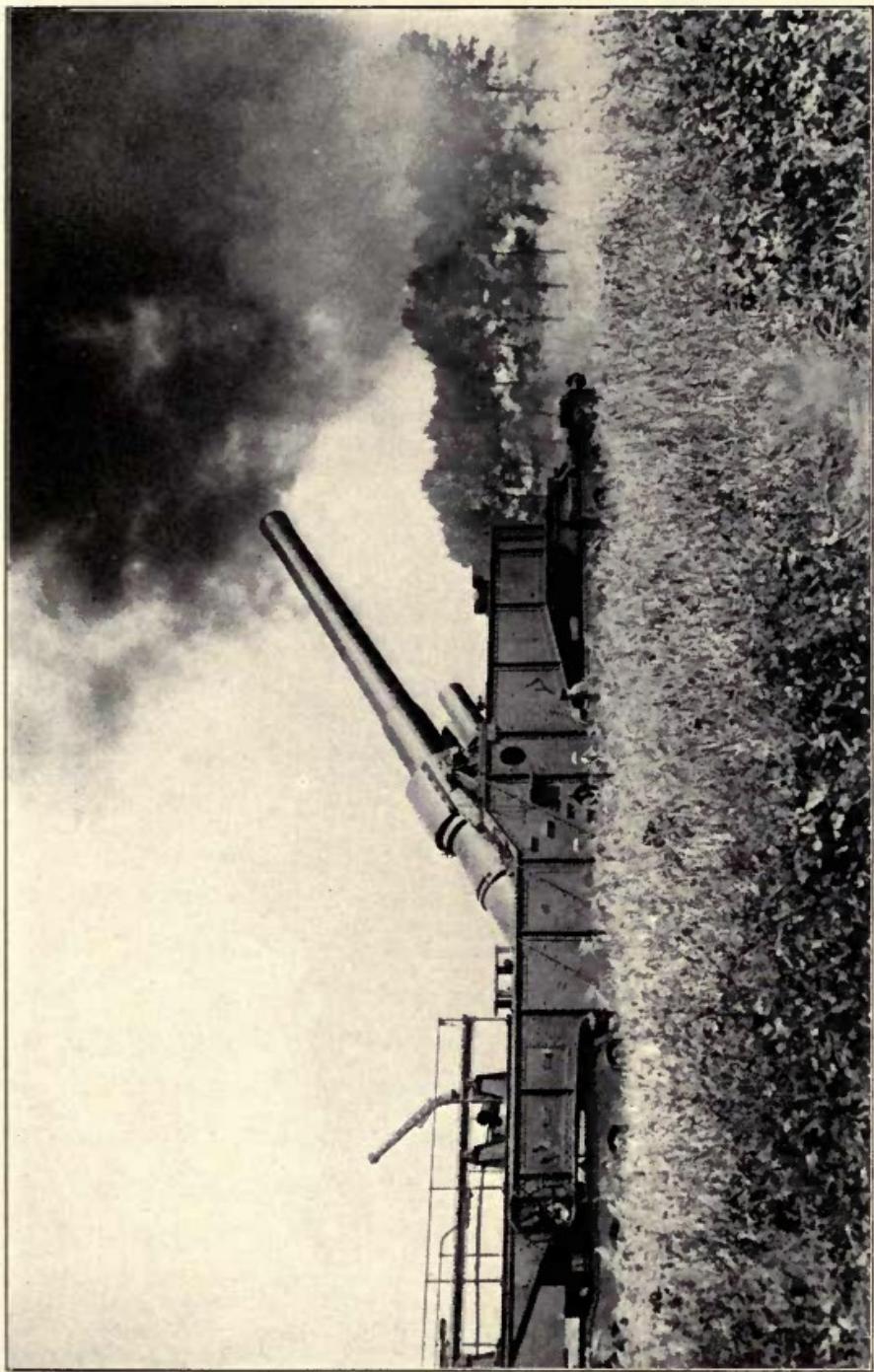
The heavy artillery comprises guns and howitzers. The guns are of greater power than those of the field-artillery, but they also have a flat trajectory. The howitzers have a curved one. In heavy artillery-fire the destructive power of the shells is greater and the effect upon the nerves of the men is stronger. The men must become used to these big shells, which hurry along, making as much noise as the rattling of a train. Practically speaking, they are not very dangerous for the men in the open, because, if they don't fall too close to the men, they merely explode with a terrific noise, throwing up heaps of stones and clouds of black smoke, without much danger to the men. The men very soon get used to it and don't fear them as they did in the beginning. The English call them "big black Jack Johnsons." Nevertheless, they have very great destructive power, and absolutely ruin strong fortifications or buildings, making enormous craters and shaking the works to their foundations. The heavy

artillery is only used for the destroying of strong points and powerful trenches which it is deemed necessary to level. In the "barrage", a certain amount of shells of heavy artillery are fired, mostly on account of their moral effect, and also because of the fact that one of these shells might, by chance, hit one of the enemy's columns and blow it to pieces. The great difficulty with heavy artillery is to bring the guns into position, for they are very heavy and require a great amount of work to form positions of batteries.

The railroad artillery is composed of very large guns, mounted on wagons, which are dragged by locomotives. They fire very large calibre shells, but the preparation of such a fire is a long one, as special railroads have to be built for such guns. The trench mortars are guns which hurl aerial torpedoes containing large quantities of explosives. The initial velocity of this projectile is a very slow one, and the trajectory is a very curved one, so that it is possible to follow with the naked eye the course of the aerial torpedo. As they do not fire very far, these trench mortars are fixed in the first lines, and can only be fired into the enemy's first lines. Having a great quantity of explosives, they prove very effective and destroy even the best dugouts, or at least ruin their entries. This last is a good point, as these dugouts whose entries are ruined

are not dangerous to our progress. Some of these torpedoes have retarded fuses, and such are used for the purpose of destroying dugouts, while others have instantaneous fuses, and prove very effective in the destruction of barbed wire. They have a strong destroying power, due to the deflagration of explosives which they contain, and thus at a distance of several metres, simply blow away the wire.

Now that we have seen the functions of the different guns of artillery, the different parts they play in the battle will be more easily understood. Trench mortars and 75-millimetre guns work upon the first position; 75-millimetre guns destroy the wire of the second position and the rest is pounded by the big guns. Should there be special strong points, the railroad artillery is used. The 75-millimetre gun and the light howitzers fight the battle during the assault, because they are effective against unsheltered men or those in shell-holes. We cannot increase the artillery to an indefinite degree, that is to say, we cannot put over a certain amount of artillery on a certain area, because this artillery would have great difficulty in working on account of the lack of the means of liaison, and the lack of observation-posts for the different batteries. Beyond a certain point in fire-power attained by the artillery on one sector, the losses both in men and material by the cramming together of guns would



ONE OF THE BIG GUNS FIRING

Official photograph from the Press Bureau

not be offset by the results of a greater fire-power. In a certain manner we can compare it to the theory of saturation. If you put too much salt in water, a certain amount of it cannot be dissolved by that water. If you put too many guns on a certain front, a certain number of guns will remain inactive or will do bad work, and all will sustain severe casualties.

We shall see now the rôle of artillery on the defensive and on the offensive. In defensive warfare in a quiet sector, one mustn't think that there is a sort of truce, or that there is no actual fighting going on. Artillery is always on the lookout, and ready to take under its fire any objective which may appear. The artillery also has to make counter-battery against an unseen enemy, that is to say, fire against the enemy's artillery. But its rôle becomes most important should an attack take place. We will consider two different attacks—either small attacks, carried out on a small scale (a raid), or a big offensive, as when the Germans attacked Verdun. The main object of a raid is to allow the enemy's infantry to gain a footing in our lines, destroy them and the dugouts, and carry back prisoners. These raids are generally made with small forces and with little help from the artillery. The rôle of our guns is, *first*, to prevent the enemy from entering our trenches; *second*, if he does so,

to try to prevent him from returning to his own trenches. But it is a very difficult task, indeed, as most of the time the whole thing happens without warning, and the Germans often have time to enter our trenches before the curtain fire is let loose. And in this case it is the infantry alone which is able either to prevent the enemy from entering our trenches or else to hurl him out by a speedy counter-attack.

A very good example to illustrate this is that of a raid which took place on the front of my battalion in January, 1917, near Verneuil, near the Aisne. At some minutes past six in the morning, strong shell-ing waked me up, and at the same time an orderly rushed into my dugout, coming from the neighboring commanding post, which was located at a distance of about sixty yards. The man came and told me that the major wanted to have me with him. It was very dark and gray mist covered the whole landscape. From our intelligence service we knew that the Germans wanted to raid all along the front held by our division. Orders had been issued by the general commanding the division that, in case of a local and strong bombardment, the first-line trenches were to be evacuated. Should the enemy enter them, an immediate counter-attack was to be made by the troops who had retired along the first line of resistance in an effort to drive them

back. We held a salient, or, rather, a company of my battalion held a salient, called the "horse-hoof" on account of its peculiar shape. That entire salient was bombarded with big aerial torpedoes, and according to the orders issued a garrison retired along the main line of resistance. I telephoned to each company to know what was going on, and the captains reported that everything was all right then. That shelling lasted for a few minutes and then ceased all at once. So I went with the major into the salient, and there we learned that the Germans had entered our first lines. We had evacuated, and according to the orders issued by our general the platoons which were on both flanks, hearing that the Germans were in our trenches, counter-attacked. The way they discovered that the Germans were in the trenches was that when the Boches came into our first lines they were astounded not to find anybody in them, and talked loudly and yelled to each other. One was plainly heard saying: "Hello, Carl. Have you an idea where these damned Frenchies have concealed themselves?" "No, I don't know," was the answer, "but I'm afraid they may play us some nasty trick." To avoid this, Carl and some of his mates lighted electric lamps, and not long after our flanking-platoons counter-attacked on both sides of the horse-hoof, in grand style, driving the enemy quickly away,

killing two of them and taking one of them prisoner. They hadn't asked for the curtain fire, because they feared that on account of the proximity of the two lines the barrage might hinder them in counter-attacking, and because they felt pretty sure of licking the Germans. All this happened in a few minutes, and the artillery had neither time nor opportunity for interfering.

Of course, this is an exceptional case, the artillery usually playing an important rôle in all attacks. Artillery has to lead the fight before the enemy attacks, while he attacks, and after he launches the assault. Should it be a surprise attack carried out on a small scale, the artillery of the defense need not be reinforced. But it is soon ascertained by the preparations of the enemy's guns whether or not they have offensive purposes. If so, all the batteries of the front which is pounded and the neighboring batteries form a concentration of fire in order to fight the enemy's artillery, that is, to make counter-battery, and also to fire against the first line. But in most cases, if the enemy launches a big offensive, as was the case for the Verdun battle, it can't be concealed, and the artillery is soon aware of the fact and reinforcements are brought to the artillery of the defense, more especially reinforcements of heavy artillery. This artillery also concentrates its fire on one special point, and deals

there its stupendous blow. The idea is to cripple the enemy's batteries which are pounding our first lines, and also to destroy all the enemy's first line and all places from which we suppose that his infantry may start for the attack. A German general said, after the Somme battle, that artillerymen should think what they would do if they were in the place of the enemy, from where they would go over the top. Having determined this, they should ruthlessly crush all such assembly-places and occasion such severe casualties to the enemy's infantry that it be obliged to scatter itself in the neighboring shell-holes and prevented from going over the top. Should our artillery not succeed in preventing the enemy from going over the top, the "curtain fire" should be let loose. Of course, we cannot count on the "curtain fire" being loosed before the first troops will have gone over the top; but in most cases it can cut the assaulting-parties into two parts—one which will speed toward our line, and another composed of the reinforcements and the rest of the assaulting waves which will not be able to cross the "curtain fire." Besides, our heavy artillery fires against all the means of communication at the rear, and against the main communication-trenches, thus preventing the bringing up of reinforcements to continue the battle. The first forces which cross No Man's Land are doomed

to speedy destruction by the garrison of the first line.

As soon as the enemy enters our trenches the local counter-attacks take place. Should the attack prove strong and should we not succeed in preventing the assaulting waves from penetrating our first-line trenches, then, at the request of the infantry commander, artillery lets loose a "curtain fire" at a certain distance behind the first lines, in order to hamper the enemy's advance, and to give time to prepare for counter-attacking. These reserves are required because the local garrison does not prove strong enough to drive the enemy away by its own counter-attacks. So while the artillery stops the Germans' progress and prevents their organizing the ground they take, it also takes under its fire all means of communication in order to keep the enemy from sending reinforcements of men and material to the newly won position. Then, a very short time after the attack has been launched, a counter-attack preceded by a strong artillery-fire takes place.

In Champagne in January, 1916, the Germans captured a position, and the reserves were hurried up in order to back the troops of the attacking sector. My battalion was hurried up from rest-billets to the rear of the troops which were to deliver the counter-attack. Our artillery, during these few hours which were necessary to bring us into a posi-

tion of readiness, had been pounding the north position so that when the counter-attack occurred the enemy made no resistance, having had no opportunity of organizing the ground, as they had been constantly shelled, had received no material, no reinforcements, and were cut off from their position of departure. In the counter-attack we regained all the lost ground and took sixty-two prisoners.

If the attack proves very strong the artillery commander designates the positions to which the batteries are to fall back and plans how this move will be executed under the cover of other batteries which will be holding the enemy at bay. It was in this way that we proceeded during the early period of the Verdun battle while we were on the defensive. It mustn't be understood that while on the defensive we stayed passive. Our defensive is active, echeloned in depth, the infantry as well as the artillery. Sometimes the reserves by these counter-attacks are unable to regain the lost ground. In that event the counter-attacks will have had for result only the slowing up of the enemy's progress. To establish our situation there will be but one means; that will be to make a counter-offensive. In the battles fought at Verdun, in a counter-offensive the artillery played a similar rôle as in the offensive, and we shall talk the matter over while setting the rôle of artillery in offensive. The great disadvantage

in the defensive (as well for artillery as for any other arm) is that we do not impose our will on the enemy, but he forces his will on us. Therefore, we cannot calculate exactly all that is going to happen, not knowing the intentions of the enemy, and so we are not able to take measures beforehand to counteract them. This we are obliged to do whilst the battle is going on.

Another great difficulty in a defensive is to keep in liaison with our infantry. The idea of course is to protect it, but very often we cannot tell exactly where it is, which part of the ground is ours, which part has been lost, etc. This last has a tactical importance, because the effect of our fire will be much greater if it catches the enemy just when he reaches a new position already quite upturned by its shells. The artillery also knows that the infantry holding the very first line is not able to form much resistance, because (as it will be explained later on) in the first lines we have very few men, and because the enemy's fire will have utterly destroyed and levelled that position, and thus disabled the few men forming this garrison. Another difficulty is that the enemy outnumbers us in guns. Having prepared an offensive, he has an immense superiority in artillery. The only way to locate our infantry will be by aerial observation, but this is done with difficulty, as the enemy will have assem-

bled big fleets of planes in order to gain the mastery of the air on this sector, which will try to prevent our planes from flying and from bringing home any information. The enemy will try to blind our artillery and to stun our infantry. You can thus see that in the defensive battle our gunners have very trying work, indeed, and that they sustain severe casualties, having to fire under the most difficult circumstances, being submitted to the fire of shells of large caliber, and firing in an atmosphere of gases, not knowing where the infantry is, not seeing much on account of the dust and the smoke. Our gunners did behave most bravely in this fight during the Verdun battle, and it is by their gallantry and their spirit of self-sacrifice that they were able to cripple the German offensive, and so afford the infantry the chance of encountering the enemy. My regiment was holding the sector of the Bois Fumin in June, 1916. From the 21st to the 23d the Germans launched enormous attacks, composed of picked infantry, and backed by such powerful artillery that our aviators said that they were unable to locate individual batteries, as all the counter-slopes and all the covers swarmed with German artillery. During this battle, though subjected to heavy counter-battery, our gunners fired the whole time, and by the accuracy and efficiency of their fire caused the admiration of my regiment. On the

21st of June they fired for four hours without interruption.

In the offensive, the rôle of artillery consists in preparing this offensive, that is to say, in opening a way for infantry to help the infantry during the assault, and in being ready to cripple any counter-attack. In these offensives huge masses of artillery are put into action, requiring enormous amounts of ammunition. The first thing is to select good observatories and to have good means of liaison, for to have effective fire you must be able to conduct it, that is to say, to watch the results of the fire and communicate these observations to your batteries, which do not see. For a big offensive the artillery must not be brought into position too early, in order not to attract the enemy's attention, and for the same reason too many works should not be made, and all works should be immediately concealed by means of camouflage. Too many works should not be made anyway, because they soon become useless when, on account of the advance, the batteries move to new positions on the conquered ground. Therefore, most of the material should be employed for these new positions and for the batteries which are quite close to the first lines, and which will only be armed one or two nights before the attack.

Now that we have quick-firing guns in light as

well as in heavy artillery the preparations do not take very long; but in three or four days a great amount of steel is hurled upon the enemy's position and turns them into a crater-field. The enemy's artillery will be fired at with guns of great caliber in order to destroy it. In our drive on the Somme in 1916, near Bouchavesne, we found several batteries which had been totally ruined by our fire, the guns overturned, the shelters shot to pieces, and the gunners killed. In our drive on the Aisne a little before the Chemin des Dames, we also destroyed several batteries. To have been able to destroy them we must have located the guns very exactly. It is often not very difficult, because in the defensive the enemy builds very strong positions, and as they take a long time to be finished, they are very exactly located on our maps and, therefore, very surely destroyed. During the last period I was on the front the Germans tried to avoid the destruction of their guns by frequently changing their positions, even putting them in the open so that they shouldn't be located by our observatories. But planes will locate them pretty soon and they won't escape destruction, having absolutely no protection. In our drive on the Aisne in April and May we destroyed nearly thirty per cent of the German artillery we have located.

The difficulty in the offensive fight is to co-ordi-

nate the efforts of such big masses of artillery, and this can only be done if perfect means of liaison exist. Of course, in one sense it is easier than in the defensive, because most of the time, and this especially in the beginning of a big drive, the artillery's reactions are very feeble and, therefore, the chances are that our means of liaison do function. But, anyhow, you must always bear in mind that some of them may be crippled, and that therefore others must be always in readiness to afford us every assistance required. The offensives of the 5th of May and of the 25th of April, during the battles of the Aisne and Moronvillers, gave us a good example of the services which our liaison could render and, therefore, our artillery did splendid work. My regiment attacked at nine o'clock in the morning, being preceded by a strong and well-executed creeping barrage which silenced the enemy's batteries. (They fired only at 9.35 and their fire on the rear of our line was not effective till 4 P. M., so that we had sufficient time to organize the conquered ground.) But it must be stated that after we had carried the enemy's position, our artillery did not remain inactive, but made powerful concentration of fire against the enemy's batteries, forcing them to fall back and take up new positions at the rear, and those who did not had a very difficult task on account of the continuous shelling.

CHAPTER V

LIAISON

HOW are we to handle these powerful war-machines, in order to obtain the maximum effect, and to have them work harmoniously? Bare common sense will make clear to us that the only way to gain the full value of mechanical power, secured by war-machines, and enabling it to render valuable assistance to man-power, is to have the human and mechanical power act in very close co-operation. We must be able to have strict control over them and to have them work when we want and as we want. Such co-operation can only be attained by improved means of liaison, and to accomplish this purpose science has entered the service of the army.

This branch of military science has, like all others, made amazing progress. When the war broke out, orders were carried by couriers or transmitted by telephone or by signalling with flags. These means of liaison very soon proved inefficient and not appropriate to the requirements of modern warfare; horsemen could hardly be expected to be used as couriers, for they are not able to reach the com-

manding posts on account of the torn-up ground and of the innumerable trenches and defenses. Roads are not passable for cars and motor-cycles near the front. There remain the runners, who were greatly used in the Verdun battle; but this is a very slow and costly method, and should be used as seldom as possible. Signalling by flags did not prove very valuable on the western front, and it has hardly ever been used, for men are not able to signal standing without being detected by the enemy and shot by its snipers; besides, this mode of signalling has but a very short range and is therefore a very slow means of liaison, for it is necessary to have a great many signalling posts, and this means that it will require a long time to pass a message. The conclusion from this very short study of the means of liaison used before the war is that they did not answer to the requirements of modern warfare, and therefore the French General Staff had to study the question very closely and find a solution of the problem.

In the beginning of the trench warfare we used the telephone very much; soon in every trench there were telephone-wires. But as the artillery fire grew more and more powerful, and became a drum fire, the wires were always cut, and it became quite impossible to telephone during operations. On the other hand, as we often used returning-



Official photograph from British Pictorial Service

BRITISH SOLDIERS SIGNALLING BETWEEN THE SUPPORT AND FRONT LINES DURING THE
BATTLE OF FLANDERS

by-the-earth conduction, the enemy picked up our conversations by listening-machines. The following instructions were therefore issued: All lines must be of double wire within at least 2,000 metres of the first position and completely insulated. Lost current, which results from worn or defective insulation, may operate on German listening-phones; it is therefore strictly forbidden to make any allusion by telephone of events which might in any way benefit the enemy, and it is therefore also forbidden to have telephone-lines from the battalion's commanding post to the companies' commanding posts. To prevent our lines being cut, we bury them at a depth of two metres. There is one main line running from the army corps headquarters to the divisions' and the divisionary infantry commanding post and to the post of correspondence, where a staff-officer is permanently stationed, and which is at the height of regimental headquarters. The regiments branch their lines upon this main line, which can be compared to a main line from New York from which all telephones of the neighboring towns are branched. The personnel employed comprises, for each battalion, one non-commissioned officer, two corporals, and ten telephone operators.

We also use signalling-lamps and portable search-lights; the first have a range of 500 to 1,000 yards

by day, and by night of 1,000 to 3,000 yards. We had two of these per company, but they will progressively be replaced by portable search-lights of 14 centimetres, which have a range of 1,000 to 3,000 yards by day, and of 2,000 to 6,500 yards at night. Besides, we also have the portable search-light of 24 centimetres; range by day 1,600 to 6,500 yards, by night 3,000 to 11,000 yards; allotment, four per regiment. Each battalion has one corporal and four signalmen to handle these portable search-lights and messages are passed by means of the Morse alphabet.

Another means of liaison is that of runners who will double the other means, posts of two runners each are placed at intervals of 150 to 300 yards.

Wireless telegraphy obviates all question of distance and obstacle, but the number of stations must be limited, otherwise there would arise a great confusion in detecting the different waves caught. There are two radiotelegraphic stations by division, and besides all planes are equipped with radiographic apparatus, and are thus able to correspond with the headquarters.

Earth-conduction telegraphy (e. c. t.), a method of sending currents through the ground, is also used. We have one sending-station per battalion, and one receiving-station at the colonel's headquarters. Pigeons rendered valuable services. Each battalion

has four pigeon-carriers, these are used in cases of emergency.

Rockets and appliances for signalling are greatly used. Bengal lights serve for the purpose of marking the front line for the planes. Signal-rockets and other varieties, as caterpillar-rockets, rockets with red or yellow smoke, flag-rockets; are used for the purpose of signalling.

Signal cartridge 25, also called military telegraph star, sends a white, red, or green star which lasts eight seconds. We also have the signal cartridge 35, used for the purpose of communicating from the line to the rear. The V. B. rifle-grenade discharger, using a special blank cartridge, can throw the following rockets: parachute stars, red, white, green, one star, three stars, six stars, caterpillar, red smoke and yellow smoke. With all these devices we form a special code enabling infantry in the line to correspond with the rear, and more especially with artillery.

Perhaps the most convenient of all liaisons is gained by the plane, which always is able to fly over its own lines and to bring back in a very short time photos of any line, showing exactly the positions occupied by our troops, who mark their lines either by using Ruggieri pots or Bengal fires, or in spreading their panels. These panels are made of waterproof linen, white on one side and neutral on the

other, and are from 1.6 to 1.3 feet large. They are left spread until the plane has signalled "Understood," but in no case more than fifteen minutes. Infantry is also able to correspond with the plane by means of identification panels and triangular panels, with which different figures are formed, each one of these having a different meaning.

Liaison must be very closely established between units of the same arm; therefore the majors commanding the battalions in support go ahead in the big offensives with the majors commanding the first-line battalions in order to secure immediate information from those they are to reinforce. Liaison should also exist between different arms; artillery can only work efficiently if it is in close touch with infantry, and particularly with the units they are to support. Such connection is established by constant understanding between infantry and artillery officers. Their command posts should be established in close proximity of each other whenever possible. Artillery agents from the battalion on are with the infantry.

This rapid sketch gives a faint idea of the extent and of the complexity of this problem, an all-important one, on which the French General Staff has devoted all its care. The means of liaison are as the nerves of the battle-field which carry to the remotest cells the thought of the brain—the gen-

eral. If they do not function properly, parts of the body will not be able to act as they are told to; there will be no harmony in action, and therefore the body will not give its maximum output; for all movements must be co-ordinated under one single will which directs all energies to one sole aim.

CHAPTER VI

AVIATION

AVIATION, that is to say, war aviation, has revealed itself in the present war. Before this war began it was merely a sport, and we had very few machines compared with the number we have now. At the outbreak of this war, aviators knew nothing of firing from a plane. A man who would have taken a rifle up would have been laughed at. Now conditions have entirely changed. From the experience of the war, tactics have been created for planes and new types of machines have been built which are adapted to the services required. We have had to build quantities of them, and train a great many pilots as we increased the number of planes, and also on account of the losses which were sustained. Two principal qualities which should be possessed by planes are vertical speed ascent and horizontal speed. Both of these should be as great as possible because, if the enemy's planes outrange them, they will be in a great state of inferiority and will have many chances to be brought down by the enemy. We have divided the rôle of our planes as follows: The observing planes, the fight-

ing planes, and bombarding planes. The changes brought in this war have rendered it necessary to have many planes.

When both armies stopped face to face and dug trenches, their very first idea was to conceal themselves from the enemy's view, in order not to be subjected to its murderous fire. Therefore the use of camouflage became very extensive, and it was almost impossible to observe from the earth, and quite impossible to observe positions which were toward the rear.

In open warfare, when we wanted to know what was going on behind an outpost-line forming a screen and preventing enemy incursions, we used to get the information by fighting; either sending cavalry troops or detachments of infantry, cavalry, and artillery which were to get through these lines and attack the enemy in order to force him to bring reinforcements, and when this was attained to retire. Thus we were able to see where these reinforcements were, their strength, and what the enemy was preparing behind the lines. Now this mode of information is an obsolete one, for the delivery of such an attack would require extensive means both in men and material, because the lines are protected by strong barbed-wire entanglements and the positions are held by troops strongly echeloned in depth. So another means had to be found.

On the other hand, the conditions of life in the trenches become intolerable when the artillery constantly keeps our position under fire, so aviation has had to be developed; first, to be able to see what was going on behind the first line, to see what defenses, what trenches the enemy was building, what movements of troops he was making at the rear. Every time the enemy prepares an offensive, new railroads are made and unusual traffic takes place, and new jumping-off trenches, commanding posts and positions of batteries are built. How can we get this information except by plane? So the very first necessity of planes was to know what the enemy was doing, to direct the fire of our artillery. Planes only could see the results of the fire and bring information about its effects; but very soon the enemy did the same thing that we did and with his planes tried to prevent us from doing this special work; so another field of aviation was brought into use, namely, fighting aviation. It was the duty of our aviation corps to gain the mastery of the air. How could it gain the mastery of the air? By being alone able to fly, having either brought down all the German planes, or having prevented them from flying.

So till now we have seen two branches of the aviation. First, observing at a great distance, and then fighting the enemy's aviation. A new branch soon developed, which was that of bombardment. Planes

were used for the purpose of dropping over factories or fortified towns or knots of communication tons of explosives in order to destroy them. The last form which aviation has taken is that of fighting troops on the ground, either infantry, artillery, or cavalry.

Now that we have seen the general outline of aviation we shall go into more detail and see how these different branches work and what their methods are. Taking observing planes first, these are divided into two great classes—the first being those which observe "at a short distance from their own line, and the second are reconnoitring planes, which go far into the enemy's territory. The first ones are planes which go over the lines in order to see what is going on and take photos. These two methods must be used because they give complementary results. The photos show the different works which are being carried on by the enemy and the correct location of these different points. But the information gotten by the photos must be completed by information of what the observer has seen. If the emplacement of the battery is concealed with camouflage the photo will not show if there is a gun or not; only the observer will be able to get such information. Of course, these two sources of information complete each other. After having taken a series of photos the planes fly back, the photos are imme-

diately developed, and in less than two hours the results of the flight may be gotten.

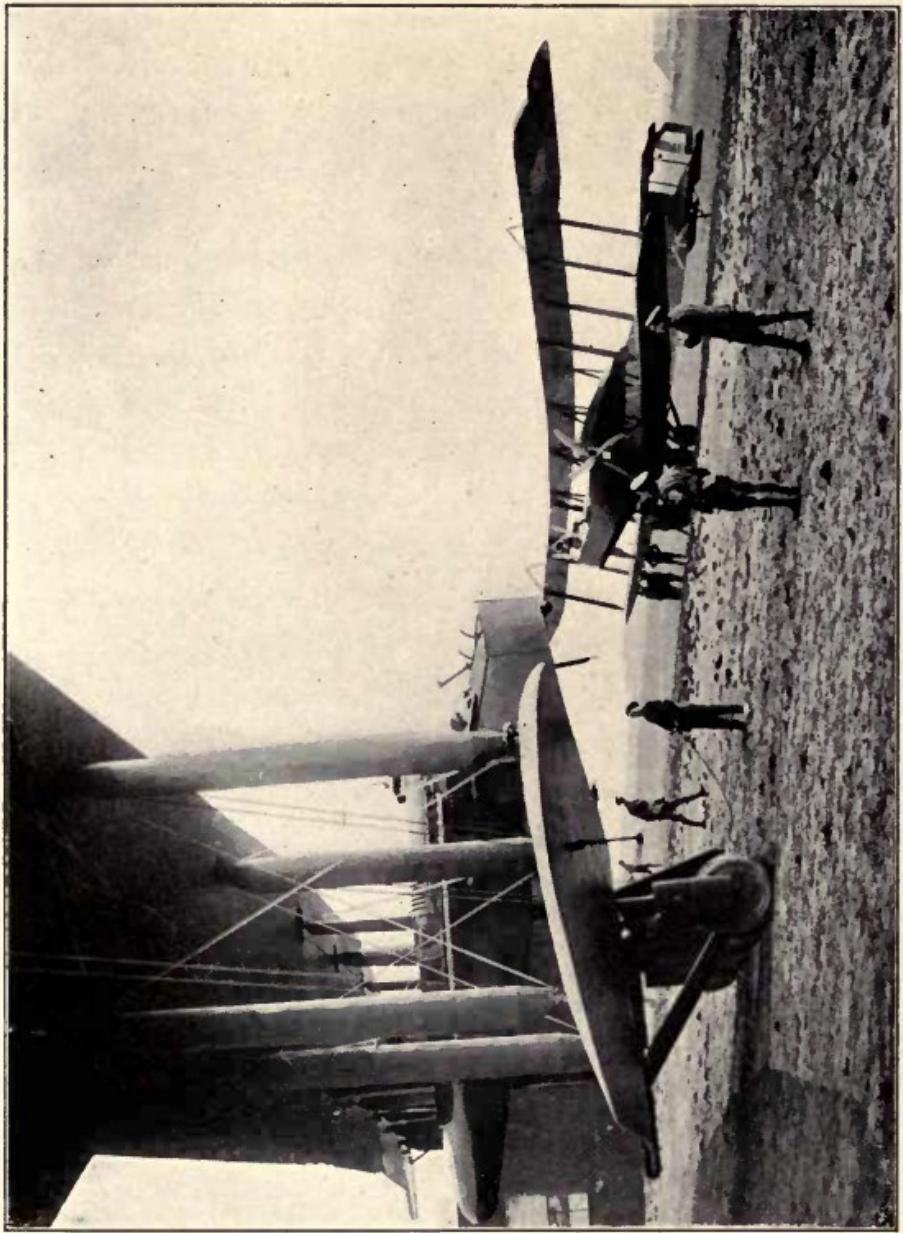
The liaison between the plane and the artillery is a very important one. The plane is the eye of the artillery, and the whole programme of aviation on the battle-field is the following: To see and prevent the enemy from seeing; that is to say, fly and prevent the enemy from flying. The planes have wireless-telegraphy apparatus, and are able to correspond with the battery and give it all information concerning the results of the fire. Before taking the air the plane has gotten in touch with the artillery and knows exactly its requirements. On the other hand, the aviator flies over a certain sector and gets very soon acquainted with all details of the landscape. For the big artillery, which fires at a very great distance, the planes are the only means of determining the results of the firing. Planes do a great quantity of work in the first part of the artillery fight, that is to say, when the artillery is registering in order to make an effective fire in a short time. This requires great skill because every shot must be observed in order to be sure the elements of fire are correct. In these observation planes are generally two men, the pilot and the observer. These machines are not as a general rule as speedy as the fighting planes. The fighting planes must be able to manœuvre very quickly to dodge

the adversary. The main feature of this peculiar fight is the necessity of coming very close to one another, even as close as fifty metres. The enemy, of course, tries to get in a better position than his opponent, and he has but two alternatives, either to flee or accept the fight. If he flees then the fighting plane will have to pursue him. If he accepts the fight then the fighting plane must make the best of it.

In reality each pilot has his own tactics, and his own way of fighting. Some try to get between the sun and the opponent, so that he is dazzled. Many fly at a great height, and then dive down with a tremendous speed, coming very close to their opponent, and fire a volley at a close range. Others try to come under the adversary, and then fly up, being always at a very close range. Others try to stay in the dead angle. The dead angle is a zone in which the enemy cannot fire. Most of the time the fighters are alone, and direct their machines and handle their machine-guns. Very great progress has been realized since it was possible to fire in front without taking heed of the propeller. For the fighting plane the great object is to be able to manœuvre, that is to say, to be able to dodge along, to climb quicker and fly quicker in a horizontal way than an adversary.

The different tactics used by French and Ger-

mans are the following: The Germans try to risk their machines as little as possible over the lines and, therefore, keep all their fighting machines in readiness behind the lines, flying at a great height and forming a sort of aerial barrage. These are very far at the rear, closer to the lines, and not so high as the machines serving for the purpose of guarding and protecting the observing planes which are still lower. When they want to cross a line we generally do not send big squadrons, but a few machines; as you see, these methods are essentially defensive. The French, on the contrary, have more offensive spirit, and they generally cross the lines in groups, squadrons, which push ahead in fighting the enemy planes, and fly back at the rear, offering fight to the enemy's fighting machines. When huge bombardments are considered, and specially in far-off raids, then we have squadrons of bombarding machines protected by fighting squadrons. These fighting squadrons are to prevent the enemy's fighting planes from attacking the bombarding plane, and thus they get over their objectives and drop the amount of explosive they have to drop there. The planes are also much used in flying very low during fighting with machine-guns and infantry. They prove very useful against reinforcements which are in rather close formation and can be dispersed by an effective machine-gun fire.



Official photograph from British Pictorial Service

AN IMMENSE R. A. F. MACHINE READY TO START WITH ITS LOAD OF BOMBS FOR GERMANY

We explained that the planes going for the reconnaissance purpose are to take photos. They have expert photographers, who take and develop the photos in a very short time, and when used to looking over such photos, and especially in comparing them to photos taken lately, it is a very easy to see how much and what sort of work the enemy has done. Planes are also used very much for the liaison purpose, either in transmitting requests of infantry or bringing orders or bringing back to the general the exact location of infantry troops. We have explained how infantry is able to talk with the plane. Of course, this plane makes itself known by a special signal accrediting him as the plane sent by the general. Infantry then, by means of panels, signals its requests, which are speedily transmitted by the plane. As the plane is at a greater height than the infantry it will serve as a fine observatory, and the aviator will be able to signal what is going on, for instance, if the enemy is preparing a counter-attack. The plane also is able to bring orders from the commanding general, and signal them to the infantry by a special signal which will be understood by every one. A great use of the plane is that it be able to fly very quickly above our line, and especially able to go everywhere. In many cases a man cannot go in certain places during the daytime because there are no communication-trenches, and these

planes can be seen by the enemy who fires and shoots down every man passing there. This was, for instance, the case of one sector held by one of my companies near the wood of Saint-Pierre-Vaast. No man was able to go to this particular point during daytime, and moving was only possible at night. The Germans delivered a severe attack on the neighboring brigade in the beginning of December, 1916, and we wanted to be able to know if our men had held their ground. What did we do? We sent a plane which flew over the lines, and took photos, after having signalled that we wanted infantry to mark its line. When the photos were developed it was plainly seen that they held the same position as the previous day. It must be understood that even in places where it is possible to go during daytime, it always takes a very long time to come from the rear to go to the front, or come from the firing-lines and go to the rear. The plane, on the contrary, gets all information at very short notice, which proves of great value.

CHAPTER VII

CAVALRY

MUCH has been said about the use of cavalry. Some well-informed people maintain that it is now quite useless to have cavalry in an army; that in modern battles cavalry will have no occasion to do its bit. Others as well informed hold that cavalry is very useful, and that no complete victory is possible for an army without cavalry. It is difficult to discuss the subject clearly before examining in some detail and studying a little closer the method of cavalry in fighting. In the cavalry we have to consider two factors, horses and men. The first requisite in a war-horse is not to be too delicate—to be able to furnish service even if not every night in a stable, even if not groomed daily, even if compelled to stay out in wind and rain. This is the very first condition, because, should the horses be too delicate, the whole cavalry would be dismounted in a very short time. The next requisite is speed. Horses must be capable of bearing their horsemen with full pack at a quick gallop; this is an essential for fighting on horseback. The next

requisite is that the horses should be strong, that is to say, able to carry their rider and full pack without tiring and losing speed. The next is that the equipment of the horses should be so arranged that the whole weight they carry will be evenly distributed; the horses' backs would otherwise be sore pretty soon, and thus they would become unable to render any service. Horses which have proved very good for cavalry are half-bloods; they are not delicate and are very speedy.

Now that we have one condition, speed, it must be utilized to its maximum effect and, therefore, the form which the combat of horsemen will take is the charge, that is to say, the hurling of a mass of cavalry at full speed against the enemy. Having speed we can attempt to secure surprise, and this is necessary, because while galloping horsemen are not able to fire they offer a good target; and if troops which are charged upon do not lose nerve, they may be able to work great havoc on the cavalry; but if these troops are surprised their morale will be so shaken as to render them unable to make proper use of their arms, and the cavalry will run down every man that flees. If cavalry is directed against cavalry it must be able to charge before the enemy can make proper dispositions. These are roughly the chief characteristics of the fighting on horseback. The charge, that is, the shock, is the purpose,

and to attain success depends upon ability to deliver, unexpected, the quicker, stronger blow. The great quality of cavalry is speed, the faculty of moving about; hence it is difficult for artillery to get the range of cavalry in movement. If we compare the cavalry with the infantry, we see that the latter acts in a series of efforts coming one after the other, and one stronger than the other; these efforts being kept up by the echelonment in depth of the great masses of reserves. It is like a tide which is rolling ahead and taking possession of the ground it has covered. Cavalry, on the contrary, sweeps along with a great effort like a tornado, but is not able to keep its own ground by its own means. Cavalry must be dismounted, and horsemen used as ordinary infantry to keep conquered ground. This is the fight on foot.

When cavalry is mounted there is no such echelonment in depth as for infantry; the idea is then to deliver a staggering blow in a short time; if, therefore, the charge is to be effective it must be made in rather close order. Should the charge be made in forages, that is to say, in extended order, the effect of the shock would of course be a very slight one; but this formation is much less vulnerable. Generally a small party of cavalry charges in forages on one part of the line in order to draw the enemy's attention to this particular point, and then charges

in masses on another part, using its maximum effect of speed and surprise. Cavalry is the arm which is used before the battle and after the battle or during the last part of the battle. It changes a success to a complete victory, a retreat to a rout. Before a battle, cavalry in open warfare serves as a screen, preventing enemy incursions, covering infantry, and serving in a way as the eye of infantry. Many things which can't be seen by planes are seen by cavalry; for instance, the details of the line, the correct location of outposts, and so on.

The great object of cavalry is to destroy the enemy's cavalry. It is a much easier task for cavalry to fight against cavalry than against infantry; the latter should only be attempted if the cavalry is able to make a complete surprise or if the foe has a very low morale. This, of course, is a question of correct appreciation of the situation by the commanding general; a prompt decision should be taken, because, if he delays, the opportunity might be lost. One of the main objects of a cavalry leader is to utilize to its maximum the conformation of the ground in order to avoid being located either by the enemy's artillery, which would put his command under its fire, or by the enemy's infantry so as to be able to come at a close range before setting loose a volley. A quick mind and a speedy execution are qualities required both by a general command-

ing a cavalry unit and by the horsemen under his command.

Great masses of cavalry have been used in the beginning of this campaign and in the pursuit after the Marne battle; big cavalry units have also been used on the Russian front and during the Italian retreat after the battle of the Isonzo. The rôle of the cavalry units is in advance of the infantry to assure its security for a great distance. Smaller cavalry units closer to infantry assure its immediate security and patrol the neighboring ground, which infantry could not do. These masses of cavalry have for their main object to destroy the enemy's cavalry, and are directly under the orders of the army commander. They seize all the passes, all the débouchés needed by an army which is progressing. They do not contain only cavalry, but also infantry on bicycles and light infantry in trucks, besides some artillery, to organize and keep the ground which has been taken by the cavalry with or without fight.

During the battle itself cavalry units are often used for the purpose of keeping liaison between two large units, armies, for instance, and to prevent the enemy from taking advantage of the gaps which exist on the enormous front on which battles in open warfare are fought. But cavalry must always be ready to take an active part in the battle.

Often cavalry masses are kept on the wings in order to prevent any movement by the opponent's cavalry on the flank, and also in order to be able to make a quick attack on the enemy's flank and, after the battle, to begin an effective pursuit, especially if a flank movement is considered possible. But in many cases in open warfare cavalry has to fight on foot in order to keep the ground it has conquered; therefore, our cavalry was not only armed with lances and sabres for the charge, but also with carbines, that is to say, short rifles, which can be slipped over the head.

So the rôle of the cavalry has been defined in open warfare. Cavalry protects infantry troops before the battle. During the battle it stands ready to interfere with its full might, and after the battle either to complete the success and force the enemy to speedy retreat, or, if the general commanding the army has decided to fall back on some new positions at the rear, then to cover the retreat and so prevent the enemy from getting close to the main body of the troops, in order that the retreating army may gain one or several days' marches over the pursuing army; in a word, to prevent the enemy from making a pursuit, only allowing him to follow the retreating troops. This mission is a very difficult one, requiring a great amount of self-sacrifice, for cavalry units will be obliged to bear alone the brunt

of the fight and must cling to the ground for a certain time in order to allow the retreating columns to fall back safely.

In this sort of fight cavalry will often be obliged to dismount, the horses waiting at a certain distance in the rear; for instance, behind a crest. The dismounted horsemen will hold their ground on the other side of the crest, but they must not allow the enemy to come too near because they wouldn't have enough time to quit their position, gain the place where their horses are, and mount them before the enemy would be upon them. It is a very difficult sort of fight, as great skill is required in selecting the position for the men and horses, and the combat is by no means an easy one, for the defense must be kept as long as possible, but not too long. The same game will start again at the next crest. Cavalry now has also machine-guns, which prove of great use in the defense of positions and will add a great fire-power to that of the carbines of the horsemen. The idea in this rear-guard combat is to force the enemy to stop his columns to deploy them in skirmish order. Then they will proceed by bounds toward the position they want to storm, but when they get at this position they will find nobody, and this experience will be repeated on the next crest. This is tiring work for the enemy's infantry, and the columns can't proceed very quickly;

so much time lost by the enemy is time gained for his opponent.

These tactics were used by our cavalry in the early period of this war, during the open warfare before the battle of Charleroi till the battle of the Marne. But when the trench warfare began cavalry couldn't be used as before. It would have been mere madness to hurl against intrenchments defended by strong fire and protected by strong defenses cavalry forces which could do but one thing: die in front of the enemy positions. So our cavalry was kept at the rear, or the men were only employed without their horses in trenches where they performed the same duties as infantry. But we have seen great changes in the uses of the different arms, and more especially of infantry. It would therefore seem very odd if cavalry shouldn't have undergone very great and definite changes, and so it has. These really were necessary because it became more and more evident that cavalry would often have to fight against infantry, and to keep the ground it had taken by charges, either mounted or dismounted. But to enable the horsemen to charge on foot it was necessary to furnish them with the bayonet of ordinary infantrymen, and as with their former armament they fell far below the fire-power of infantry, they were provided with grenades, rifle-grenades, and automatic rifles, and the number of

machine-guns was greatly increased. They now have therefore the same fire-power as infantry and a much greater power for keeping their ground; that is to say, that cavalry can be used for combat in a different way than on horseback.

This does not imply that cavalry must not be used any more simply as cavalry or that cavalry should be replaced by mounted infantry. It should always be kept in mind that, if you want to pierce the enemy's lines and force him to retreat, then will be the day when cavalry can be used, and if we have no cavalry our infantry won't be able to stick close enough to the enemy, and particularly will not be able to make bold and quick flanking movements. It was lack of cavalry which prevented the Japanese from entirely defeating the Russian army. It was the lack of cavalry which prevented the Balkan Powers from regaining a very complete victory over the Turks. Cavalry is the arm of the supreme moment. Of course, if this moment doesn't arrive cavalry can't be used as such, but if this moment does arrive cavalry must be ready fully to perform its duty. In the Italian retreat on the Isonzo General Cadorna's cavalry showed with what efficiency this arm could act on some occasions.

CHAPTER VIII

SANITARY SERVICE

THE object of the sanitary service is to keep the fighting troops in good condition, to take in charge the wounded and the ailing and cure them, and to bury the dead. The task allotted to this service is a very huge one, and it has been organized to answer these requirements. It has been divided into service of the front line and service of the rear.

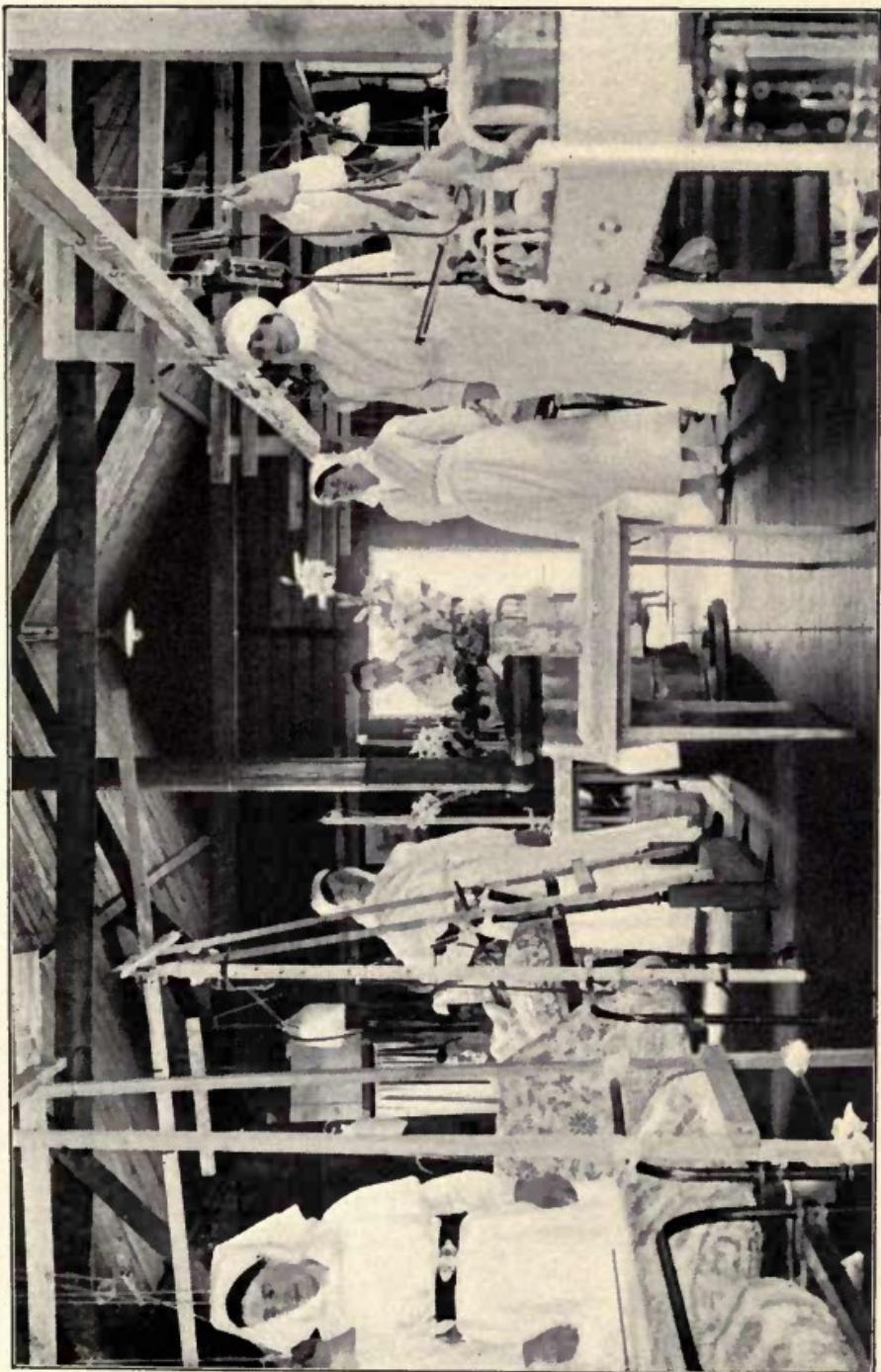
On the front line there are doctors, from the battalion to a regiment, the division, the army corps, and the army. We shall see how this service functions in the battle and when no active fighting is going on. Before the battle takes place the chief of the medical service of the army confers with the general in order to get all information obtainable in advance, and according to the plan of operations measures will be taken by this medical corps. Of course, knowing the importance of the men engaged in the fight a rough calculation is made of the losses which might be sustained, and measures are taken to be able to take care of all these wounded. These measures are for the concentration of the necessary medical material and field-hospitals.

When the fight begins the wounded able to walk go by themselves to the battalion medical post. There their wounds are dressed and the doctor gives a diagnosis about their case. The men then go to the regimental dressing-station, which is farther to the rear, and there those that are but slightly wounded are kept; their wounds are properly dressed, and on the next day they will be sent again to the firing-line. Big panels indicate where the dressing-posts are and which road the wounded are to take. The more seriously wounded pass further to the rear and there a car takes them and carries them swiftly to field-hospitals. Each wounded man carries a note of a different color, which shows whether he is slightly wounded or not. There the doctor examines their case again, and if they are but slightly wounded and able to return in a few days they will be kept near the front. If their wounds are more severe and they have no chance to recover by a certain time they are attended to in field-hospitals and then taken into sanitary trains which transport them into the interior of the country, where they will be cared for. These sanitary trains have places for the slightly wounded who can sit, and beds for the more severely injured.

The very badly wounded lie on the battle-field and very often it is a difficult task to reach them; but sanitary equips go with stretchers over the

battle-field and take up the wounded as best they can. It is a very difficult task and really requires extraordinary courage for these men to go over the battle-field under the German rifle, machine-gun, and shell fire, taking up the wounded and walking without being able to take any cover till they reach the position where they will not be visible to the Germans; but even there they must submit to strong artillery-fire. Another great difficulty is presented by the awful condition of the ploughed-up ground. This ground, which is constantly blown up by shells and in which generally there is a tremendous amount of mud, causes the stretcher-bearers to slip, yet they have to do their best not to shake the wounded brothers-in-arms lying on their stretchers. They carry the wounded to the battalion medical post. From this the wounded are transported to the regiment dressing-station and to the point where the motor-cars can fetch them.

After the battle, or rather after the assault, and more especially during the night, large groups of the medical corps go all around the battle-field. During the whole night they are a great active body, trying to rescue and help the wounded who lie all about in shell-holes, in holes, helpless, unable to move and awaiting rescue. In some cases it is impossible to do anything and the wounded must stay between the lines without attendance on account of



Official photograph from British Pictorial Service

ONE OF THE WARDS OF A BRITISH BASE HOSPITAL IN FRANCE

the fire directed by the enemy; wounded of both armies have stayed there and died in a pitiful condition. It is appalling to hear in the night the cries of the wounded, moaning and calling for help; and it is always a difficult job to get at them, because after an attack has taken place rockets are constantly launched and illuminate the whole battle-field and very, very often the Germans fire at any human being seen moving around on No Man's Land. The medical corps makes no distinction of nationality in taking charge of the wounded; Germans as well as French are taken on stretchers, and their wounds dressed in our medical posts, but, of course, these men are kept as prisoners.

Another thing, then, after the battle is to take care of the dead. Their papers are taken from them, their identity established, and the papers sent to their families. The bodies are buried in small cemeteries close to the firing-line; often it is impossible to remove them, and they have to be buried in shell-holes near the trenches. It is often impossible to bury the dead and they stay for days and weeks and sometimes years between the lines, and can only be taken care of if a new offensive is started so that we gain ground.

The rôle of the medical service of the first line is to divide and diagnose the case of each of the wounded and dress roughly their wounds. It is not

to cure the wounded, for this cannot be done, there being here no means for that, partly because the stations are necessarily placed unfavorably, generally in deep dugouts where there is little room. During this first phase little can be done to heal them, but something can be done to comfort them; most of the wounded come from the firing-line in a very bad condition, tired by the long strain they have endured, tired by the loss of blood, tired by the anguish they have sustained in creeping and crawling from the position where they have been wounded to the medical post, to the first place where they feel a little security. They are feverish most of the time and often collapse altogether on reaching the medical post; they are most of the time terribly thirsty on account of loss of blood and they are often shivering with cold, so they are brought into a hot place where they get hot drinks, are comforted, and their wounds are dressed, and then they are sent to the field-hospitals, where better care can be taken of them, where they can find beds, and rest before being sent to the rear.

The rôle of these field-hospitals is to evacuate the men as quickly as possible. Of course, speaking of the men which need a longer treatment, the very severely wounded cannot be transported as a general rule and have to be taken care of in the field-hospitals; most of the time they have delicate oper-

ations to undergo. These operations can't be done in the medical post of the firing-line, because all the necessary commodities—operating-tables, for instance—cannot be got into such places. The very severely wounded are then transported to the field-hospitals, where they are operated upon as quickly as possible, and here the surgeons have an enormous amount of work during all the period of every operation. The most difficult and daring operations are undertaken by skilful surgeons: limbs are amputated, heads are trepanned, etc; but as soon as the men get better they are sent farther to the rear, where they find better accommodations and more comfort.

For each army parts of the territory they occupy are assigned for evacuations and these have special lines connected with them. When the wounded get into better condition, if they are not disabled for active service, they return at the end of their leave to the garrisons where their regiments are quartered in peace-time. There they are drilled again, and then are sent to the front in depots close to the firing-line, to be used in reinforcing the units which have sustained losses.

The establishment of the hospitals requires a great amount of material, not only for the field-hospitals but also for the hospitals at the rear: beds for the men, sheets, blankets, bandages, medi-

cines, chirurgical instruments. On the front they are located in barracks having huge red crosses in order to indicate them to the enemy so that he may not fire upon them. Very often this has proved useless, for the Germans take no consideration of hospitals but fire upon them and drop bombs from planes. Operation orders indicate where the hospitals are.

The medical service functions also when no active fighting is proceeding. Of course, the number of doctors at the rear is greatly diminished owing to the fact that there are not many patients; the medical service must take care of the few wounded who always exist even in the quieter sectors, and they are evacuated in just the same way as I have already explained. There are also the ailing men who must go to the doctor. Care must be taken of the men so that their illness should not advance; medicines are given to them, and if they are not in good condition they are evacuated or placed in hospitals of the front where they may be cared for if there is not a congestion of wounded. It is also the rôle of the medical service to supervise the hygienic conditions, to see that regulations are respected as much as possible. They bury the dead bodies and, in one word, try to keep the place in a healthy condition.

So the rôle of the medical corps consists in transporting the wounded, in dressing their wounds, and

preventing them from getting worse, especially preventing tetanus; then in curing them so as to render them either fit for civil life and able to do some useful work or fit to fight again.

CHAPTER IX

TRANSPORTATION

A GREAT problem in war is the problem of transportation. It is one of the most important; all means of transportation, both by land and sea, must be examined.

The very first thing, before the war actually breaks out, is the mobilization of the army. A mobilization of an army like the French or the German consists in mustering a great number of men, who will be formed either into complete units or will fill the gaps of the regular army and bring the units to fighting strength. These recruits are drawn from all parts of the country and brought to the places where the regiments are quartered. This mobilization does not comprise only transportation of men, but also all the transportation of the necessary material for the living, clothing, and fighting of these men. Stores are to be transported containing food and equipment and uniforms so as to transform these civilians into soldiers. Wagons, horses, and trucks are mobilized for the fighting units and are transferred to the place where these units are mobilized. Not only existing units are increased in

number but entirely new units are formed. These also must be provided with all requirements.

Mobilization is a very complete task and a very difficult one, and has to be studied very closely in order that it should be carried out very quickly, for the idea is to get ready at least as quickly as the enemy. To gain one day in mobilization is of great advantage, because the army which is not ready will have to fall back, leaving a part of the country in the hands of the enemy and yielding valuable resources as well as all the goods which cannot be evacuated. Time has an immense value, so every detail must be closely studied and calculated and every single man should know what he is to do when the mobilization is proceeding. For instance, this man should know that on the first day he must report in this town; this other man, actually serving, knows that at the first hour of the mobilization he is to go to a certain street, to a certain house, and there take a cart and a horse; and he knows exactly where these are located; he has been there several times, so no time is lost. The time-table of the trains must also be calculated so that the number might be greatly increased without congestion.

This is only one part of the mobilization. The second part is the concentration of this army. In Europe all these operations were carried out perfectly by the Allies and the Germans. The war

was declared on the 2d of August, 1914, and the first big battle was fought on the 20th of August. In eighteen days both French and German armies had been mobilized, concentrated, and brought into action. This evidently required a great skill in the initial preparation and the carrying out of the plan of transportation of these huge armies. The concentration consists in taking the troops from points where they are mobilized and bringing them to special points where armies are mustered, and from there they will be moved and formed in order to be able to offer fight.

These concentrations not only comprise the transportation of the units themselves, but also the concentration of all means necessary to fight a great battle; namely, transportation of millions of shells, of millions of cartridges, millions of grenades. All this must be studied during peace-times, and the plan of operation is drawn according to them.

Means of transportation are of different kinds: railroads, boats, trucks; the roads are utilized by the troops marching along to the points of concentration. For all the operations in the beginning of mobilization and concentration railroads are used to a great extent, and this because they have a great capacity of transportation. Therefore, a great amount of rolling material is required. An infantry battalion takes a whole train. We generally

use trains following each other at intervals of a few minutes for the concentration. The return of this empty material must also be contemplated, and sanitary trains must also be provided for. All this has to be studied before the war breaks out, so that when war is declared it is only necessary to refer to the time-tables which give the new schedules.

The enemy will be greatly interested in disturbing or hindering transportation of troops, and spies may be sent for the purpose of destroying bridges or other vulnerable parts of the line. All these parts must therefore be provided with a guard in order to be sure that no mishap will take place and that the traffic can continue safely. Another vital point of study is the functioning of the train system in stations in order to prevent congestion there. If a station gets congested it is quite impossible to get trains out or in, and that station forms a sort of wall which renders traffic impossible or, at any rate, delays greatly all the trains which have to pass through that station. This was a very difficult problem for us to solve during our retreat, when everything and everybody, not only the fighting troops but also the civilians, the goods and the depots and the hospitals, had to be evacuated. This produced an unusual traffic which had not been taken into account.

We have in our regulations very strict rules concerning the transportation of units in trains; the

guards are posted and the men enter at a given signal and in good order. All this is done for the purpose of gaining time. Another great difficulty is when a sufficient number of trains does not exist. This may occasion very long delays, and not only for the entrainment of a particular body of troops, for this delay will be repercussed on following trains. Another thing which takes also a long time is the embarkation of the wagons; we therefore have specially trained parties who are very familiar with methods of loading and packing these wagons. The disembarkation should also be made in good order and according to special rules; the units are formed, and when formed they march off, leaving place to another train. Animals, and especially horses, prove sometimes very difficult in entraining. They are afraid, plunge and kick wildly, and when they are brought into the cars they continue plunging and kicking for a while. To have things run smoothly requires parties of men well trained in handling both animals and material.

After the early period of the war we used trains almost exclusively for the transportation of material, daily supplies, and all other supplies. Men are transported in trains as a rule only when very long trips are contemplated, as, for instance, when my regiment was transported from Verdun to Chantilly, or from Champagne to Verdun. We more often

use trucks in moving troops, and they have rendered us very valuable service. The first requirement for obtaining good results from this mode of transportation is strict discipline on the road; otherwise congestion will very soon occur and it will take hours to set things in good order again. Another requirement is a sufficient number of roads, and good roads. To properly police the roads we have two distinct authorities: first, men at the various branches who stop a convoy or order another to go—in one word, prevent congestion as policemen in a city; then the different chiefs of the convoy itself, riding in speedy motor-cars so as to be able to pass quickly from one end to another of the convoy. There is always one officer riding in front and showing the direction so that the drivers may not get lost; others pass from one end to another of the line and see that things are in proper order. The convoys are divided into sections, each with its chief. Between the trucks a distance of about seven metres should be kept; between two sections a greater distance. These distances are given in order that the whole convoy may be rendered elastic and so that if one of the trucks for some reason should be obliged to diminish its speed, this incident would not be felt all along the column.

These convoys have repairing-machines, so that if an accident happens to one of the trucks it can be

repaired; the convoys have also extra cars, so that if one is disabled the men are simply shifted to an extra car, the broken car being repaired if possible by one of the repairing-cars.

Troops are thus very quickly shipped from one place to another without the enemy noticing it, as these movements can be carried out at night. Trench convoys proved of immense value for us during the battle of Verdun. We used them a great deal also during the Somme battle for the relief and for the purpose of bringing new troops to the battle. We used them because as a great amount of troops were in this sector all the rest-billets close to the firing-line were crammed with troops ready to go into action, and thus troops needing rest were relieved and transported very far to the rear in order to rest and become fit again for new operations.

This work is a very tiring one for the drivers, because in active operations when big movements of troops take place they have for some days to work day and night. Artillery, cavalry, and all the wagons of the infantry have to utilize the roads, and therefore cannot go as quickly as infantry, but if very great movements are not contemplated this doesn't make a very great difference. This means of transportation offers the advantage of preventing the road from being filled up with long infantry

columns which would delay the cavalry and artillery columns and the wagon-trains. Besides, long marches are very tiring for infantry, and if they can be avoided the men come in much better shape for action.

The trucks not only transport men but they also transport a certain amount of material, as ammunition, cartridges, grenades, and all the material necessary for the trenches, to stations close to the lines. There this material is discharged and shipped over on narrow railroads, which carry it as near as possible to the lines, and from there fatigue-parties transport it to the first-line trenches. In sectors where great traffic takes place, the roads are only utilized by trucks, cars, wagons, and artillery, and all the neighboring trails are exclusively reserved to infantry, in order that convoys may speed on without being stopped by infantry columns, which always delay them because infantry has a natural tendency to open the ranks and to utilize the full breadth of the road, preventing the convoys from passing till the ranks are properly formed again.

Special trucks are also used for the transportation of wounded. These are the so-called sanitary cars. Their purpose is to transport the wounded quickly to the hospitals, and this is very important, because in the medical posts on the line only the very slightly wounded can be properly taken care of; so if some-

thing must be done for them they must be quickly sent to the rear. These trucks are managed in such a way that the slightly wounded can sit and the severely wounded can lie in stretchers. They must be well suspended in order not to shake the wounded inside.

Troops may have to be marched on roads, and then strict discipline should be enforced so as to leave one side of the road free for easy passage. In France infantry marches for fifty minutes and then gets ten minutes' rest, and so on again. If the march is continued for a whole day the men rest for at least one hour for their meal. A certain interval is kept between units, and when the ten minutes' rest comes these intervals are taken again; these intervals prove very useful, for when a check takes place at the head of the column they prevent the different units from closing on each other. This is particularly annoying when it takes place on a very long column. Experience has proved that when there is a slight obstacle, as, for instance, a particularly muddy place, the men at the head of the column try to avoid it and so displace themselves slightly, and this occasions at the rear of the column a check which can't be understood. It is very trying when such checks often take place. To prevent this a strong discipline must be observed, and as many columns formed as possible, for such checks

cannot be avoided if huge columns, such as division columns, are in line. On the other hand, when the movement orders are issued all available roads should be carefully considered. The passing of crossroads by two columns should also be studied. The staff must calculate at what time the column is to leave and then calculate again at what time the column will arrive, knowing that in one hour infantry will cover four kilometres, this hour including the ten minutes' rest. Another difficulty lies in forming the columns, for the troops are scattered in different rest-billets; a special hour should be given for each unit to start and all watches should be properly regulated. Then the units should pass a given point at a given hour, each unit at a different time, so that automatically in passing this special point, called the initial point, the column would be properly formed.

For each unit there should be designated a place of assembly and all the units in the same rest-billets should be formed in one column. All these small columns pass at one initial point to form the whole column. Large columns should be avoided, for in large columns the speed of the march is much lessened and it is much more tiring for the men. Of course, the formation of the column will be dictated by tactical and strategical reasons. The column breaks up in the same way that it was formed.

After a certain period the units take the different roads leading to their respective quarters.

It isn't only infantry that has to make marches, but all the different arms: cavalry, artillery, etc. These form separate columns and they should never be mixed up, otherwise congestion will result and occasion great delays. The marches of these columns should be protected in open warfare by vanguards—patrols which assure the security of the whole column. By this we mean that they are pushed sufficiently far ahead to give to the column the time to deploy and make ready for action. The longer the column is, the longer the time required.

In trench warfare precautions should be taken that these columns shall not be seen by the enemy, therefore the roads are concealed by means of camouflage from the direct sight of the enemy, and most of the time these marches can only be carried out at night or at dawn on a misty day and by small columns which pass at given intervals. In every case the columns should be protected from aerial sights and attacks.

Another means of transportation is by boats, either on rivers or on the sea. On rivers or canals special boats are used, boats with a flat bottom, and these boats are pushed by trawlers. In these boats ammunition and also some goods can be carried, but men as a rule, except wounded, are not so trans-

ported, for it is a very slow way. In some of these boats hospitals or resting-stations have been put up and in these the wounded are very well attended to and can be very well taken care of while being transported.

Sea transports carry men and material. They are used for the armies overseas, as, for instance, the Allied armies in Saloniki or for the transportation of men and goods from America. A great problem to solve in sea transportation is the submarine menace. Since this war began a quantity of men and material have been transported by our navy and comparatively with very slight losses.

CHAPTER X

FOOD-SUPPLY

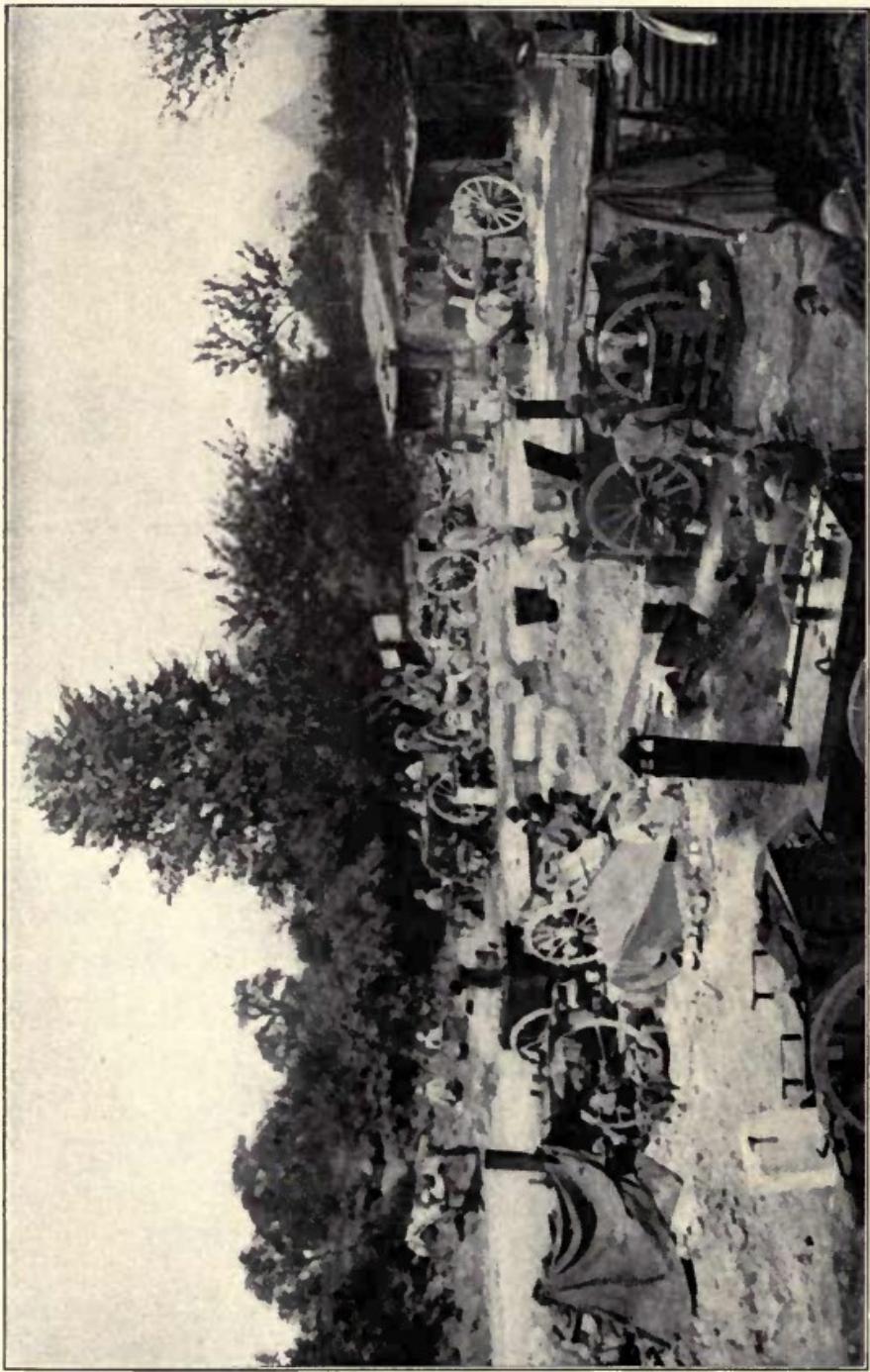
TO have an army fight well it is necessary to feed it well. It is not an easy problem to transport everything required for the keeping up of the huge armies which are now in the field. The men get either rations (food kept in tin boxes) or food delivered by the "food-supply." Each man has two days rations, this being supplied in order that he may be sure of nourishment should there be no supplies for two days. This is especially the case during active operations when the supply becomes irregular on account of the heavy shelling, which closes all the ways leading from the rear to the front. In the food-depots still more reserve rations are stored in order to be able to feed the men should the daily supply not arrive. These rations consist of corned beef, dried vegetables, sugar, coffee, and condensed soup, and in some armies chocolate is added. The idea is to get the greatest amount of food in the smallest possible volume. These rations are constantly carried by the men in their packs, but they are not allowed to eat them except when ordered.

During offensive operations the supply is very irregular and the men and officers mostly live on rations, but this is not the usual food. They get meat, which comes frozen up from America and which is brought in meat-trucks (formerly the busses of Paris) from the station where all supplies are brought in, and the meat is then distributed to the regimental wagons, which bring it to the different battalions, from which each company gets it. It is cooked in the field-kitchen, but the men do not always eat conserved meat; they get fresh meat as cattle are kept in the rear and well looked after. They are then brought to slaughter, and the meat sent to the troops. The other supplies, such as vegetables and jams are also brought in trucks and then distributed to the different units. There is a daily supply-train which brings in all the supplies necessary for one day. Bread is not brought from the rear or from the interior, but is made by the military bakers attached to the different units. The most difficult part of the task of supplying the troops is the distribution. Fatigue-parties leave the lines (in arms, of course), go to the rear, and wait there for the field-kitchens, which in active sectors move every night and come as close as possible to the lines. There the men take them in charge and bring them up to the front. It is very tiring for them, because they are heavily laden and when

shells hurtle over them they cannot drop everything in order to attend to their own safety—they would not be welcomed by their comrades if they did so.

Of the supplies, one of the most popular items is undoubtedly the wine, and the men are careful not to lose a drop of it. When we were in the Somme, the night after the attack of the 25th of September, some fatigue parties were sent to bring up supplies. One of the men came back and told me that "these Boches were really beasts." I asked him how he happened to have discovered that and he answered that "they didn't respect anything, not even the supply of wine, and that a splinter from one of their shells had pierced his only bottle so that all the precious liquor had been lost!"

It is quite an easy task to bring up supplies in a quiet sector because the communication-trenches are in good condition and far to the rear, so that it is not very dangerous for the fatigue-parties to make the trip, as most of the time the shelling is not very dense. But in offensive sectors this is not the case, where the rows are kept a great distance to the rear and where no communication-trenches lead from the first shell-hole line to the places where the field-kitchens come. In such sectors the enemy is shelling the whole time and very often curtain fire of guns and machine-guns is let loose. The zones which these fatigue-parties have to traverse are



A FRENCH FIELD-KITCHEN ON THE SOMME

quite difficult ones on account of the number of shell-holes, besides which they find great difficulty in finding their way back to the shell-holes they originally left. In these sectors we often use little Arabian donkeys, which greatly help the men. When in an offensive sector, it is impossible to send many men to the rear, for fear the enemy might launch an attack; so a few men have to carry all the supplies for the whole party, and this, added to the difficulties we have already pointed out, makes the whole question of food-supply very difficult and complicated.

CHAPTER XI

LIFE IN THE TRENCHES

TO gain a proper idea of the life in the trenches it is necessary to realize what trenches really are. They are narrow excavations, about four feet broad and six feet eight inches deep. The embankment on the side toward the enemy is called the parapet and that at the rear of the trench is called parados. In order to allow the men to fire special steps are made called "firing-steps." They are at a depth of about four feet, eight inches. The bottom of the trench is only three feet wide. Two men can pass each other in the trench, one being on the firing-step and the other in the trench itself. These trenches do not form straight lines but follow the contours of the terrain in order to afford a good field of fire. They go zigzagging, form salients and re-entrants, and thus allow the use of cross-fire. In field-intrenchments it was necessary to have a good field of fire at long ranges, but in the present form of intrenching this does not appear so necessary because the trenches are quite close to those of the enemy and are protected by an amount of barbed wire, which prevents the enemy from enter-

ing them. Trenches are located in such position in order to enable the garrison to fire effectively and annihilate the enemy's assaulting waves while crossing No Man's Land.

The front lines are very often badly chosen from a tactical point of view. This is because we had to stop and dig trenches during the fight, either during the pursuit after the battle of the Marne or in the big offensives which we launched afterward, namely, Verdun, Somme, Aisne, and Flanders. These first lines have behind them other trenches, which are called support-parallels. Some of them are on the counter-slope of hills or ridges. The positions on the counter-slopes are very favorable, because when the enemy appears at the crest all the fire-power is used and the bullets which do not reach the first waves will reach the others which are at the crest. If the bullets go too far they will go over the crest and may by chance hit some of the enemy who are behind it. These positions in order to be useful must be provided with observation-points at the crest. All the trenches have means of communication with the rear, so-called boyaux, or communication-trenches. These communication-trenches are merely trenches going from the front to the rear and generally without any firing-steps, although in some cases they are provided with some. This is done in order that the men may be able to

fire on any enemy who may have gained a foothold in the first lines. They are used for the purpose of dividing the ground into different sectors, able to resist by themselves should the neighboring ones fall into the hands of the enemy. Naturally such communication-trenches are protected on both flanks with wire entanglements.

Any position forms a veritable network which covers the ground with trenches, boyaux, and works of different kinds. This net would appear quite useless to the eye of the layman, but looking at it with more attention you become aware that some parts of these trenches are so called "active" parts; that is to say, parts in which there is a garrison and which has a fire-power, while others, called "passive" parts, have trenches serving merely as means of communication and are not provided with a garrison. They are defended in front by barbed wire and by flanking fire from the active parts. In this net of trench-works there are so-called centres of resistance, little strongholds which are improved very much and in which there is a garrison, sometimes a platoon, at other times a battalion.

To grasp fully how the defensive is organized in trench warfare it must not be imagined that we defend parallel-lines of trenches and that after having taken one line of trenches we take another and so on. This would give quite a false idea of

this warfare. Actually the defense is composed of series of strongholds which can protect each other by strong cross-fire in order to prevent the assaulting forces from taking the whole position and to prevent them from rolling on like waves. These strongholds are as piers in a bridge which divide the assaulting waves into a series of groups that can have no connection one with another, are separated by centres of resistance and submitted to strong cross-fire from these strongholds. On the other hand, as the defender knows perfectly where the enemy's assaulting waves will be allowed to progress a stupendous shelling can destroy the daring foe who gains a foothold in the positions. You can realize how difficult the task of the attacking troops is. If they want to proceed, their forces must not be shattered, their front of attack must not be broken, and they must be able to push ahead as a powerful tide which sweeps everything before it. It must not only sweep everything before it but must also occupy the ground which it has attacked. The rôle of the trenches is to prevent this from happening, and the whole life in the trenches has but one sole aim, to be ready to meet the enemy and hold him at bay. Fighting does not always occur, and most of the time the men have to be ready to fight, but the attack does not come.

If we want our soldiers to be fit for fighting at

any moment it is necessary that they should be in good physical condition. For this it is essential that they be sheltered from bad-weather conditions and get good food. To shelter them, dugouts and shelters are built. They serve for a double purpose, namely, to protect the men from the enemy's missiles and, secondly, to provide them with as comfortable resting-places as possible. The deep dugouts are underground, with generally a staircase leading from the trench, and are constructed on the side of the trench toward the enemy in order to prevent a shell from entering the opening to the dugout. The flight of stairs has usually from twenty to forty or more steps, and they reach to a depth of at least five and sometimes eight and ten yards in order to afford protection from heavy shells. At the bottom of this staircase there is a long gallery, perpendicular to the stairs and at the other end of the gallery there is another flight of steps leading up to the trench. Each dugout always has at least two entrances, sometimes more. In this gallery, which connects the two entrances, are beds of heavy wire screen and there the men rest. This wire screen is held up on four poles and has a wooden frame.

In the trenches the men generally have to suffer more from other enemies than from the real one, the Germans. Among the most terrible are bad-weather

conditions—rain and frost wear and melt away the trenches, forming a liquid mud, and little by little the parapet and parados crumble. In the trench itself it is not rare to find mud as high as the knee and often even higher. In Eparges, in February, 1915, several men, slightly wounded, could not be transported and died, buried in this mud, which swallowed them up. On the Somme, near Bou-chavesnes, I recall, on the 18th of November, 1916, finding two men of the 67th Regiment who were buried as high as their chests and we were obliged to haul them out with ropes. To avoid this mud is a daily and constant task, but it is very difficult because the trenches form canals in which the water gathers naturally. So, first, we must protect the parapet and parados of the trenches and prevent them from falling, and, secondly, we must try to keep the bottom of our trench dry.

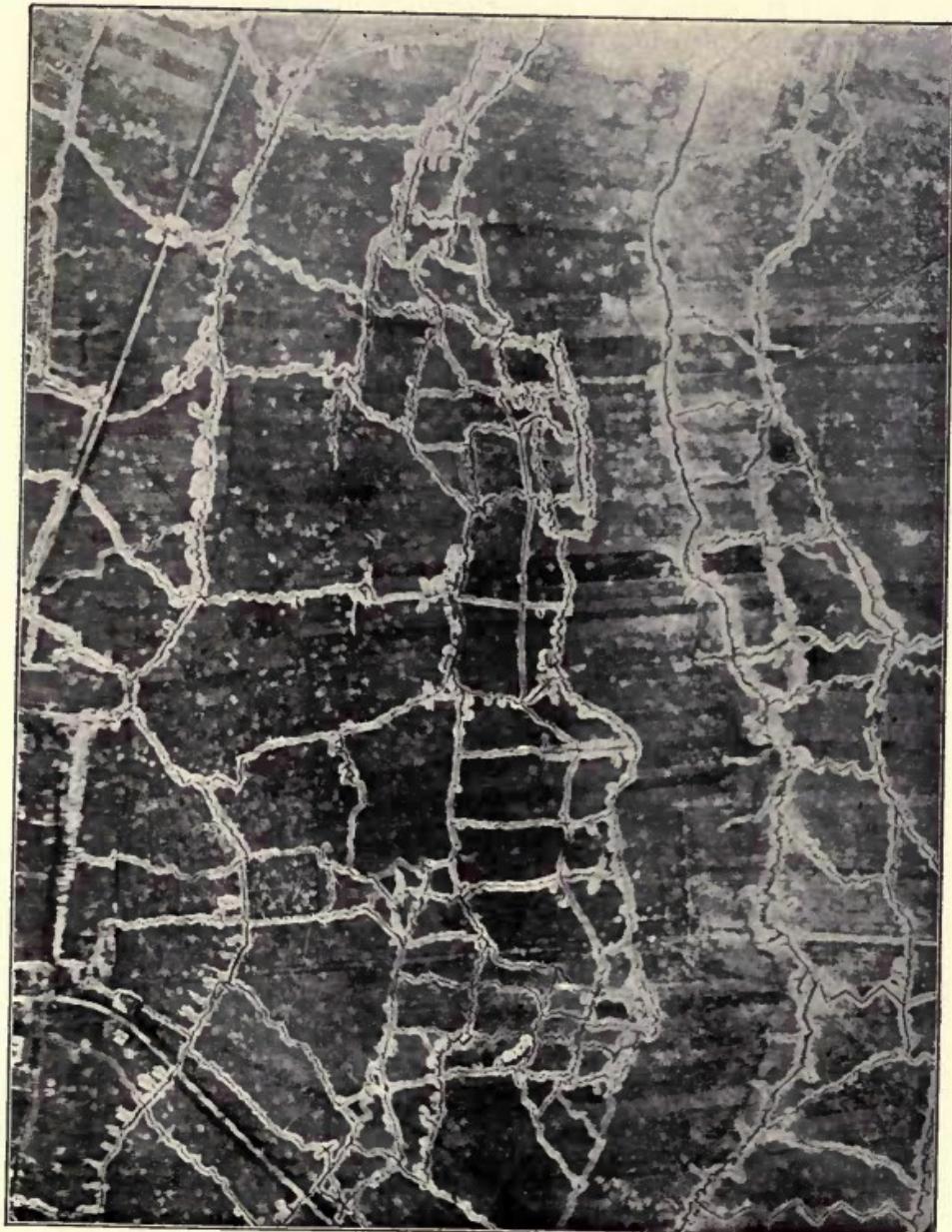
To prevent the parapet and parados of our trenches from falling down, revetements are constructed. These revetements are of various kinds. Some are made with wire screen placed against the walls of the trench and held with stakes, some with sandbags or with gabions or with hurdles. The hurdles are made of four or five pickets pointed vertically, with flexible brushwood woven around these uprights.

The most difficult task is to get rid of the mud in

the trenches. For this ditches are made in order to collect the water and direct it into little shallow wells, called sumps. The bottoms of the trenches are mostly covered with latticework, but much of the time this does not suffice and the men are obliged to throw the mud out of the trenches with shovels and scoops. When it is cold or damp it is very trying for the watchers to stay motionless during the two hours they are on post and always watch the enemy. They must be warmly clad, and wear sheepskins over their coats and use water-proof boots.

In the dugouts it is necessary to fight against the rats and mice which swarm around and steal away all the food. They have to be poisoned and sometimes dogs and cats are kept in dugouts for the purpose of killing them. In summer-time swarms of flies are in the trenches, and it is very difficult to destroy them, for there is such a great number of dead all around and this is a source of perpetual danger. It is sometimes impossible to remove the dead, who are in No Man's Land.

The men have to work very hard even when they are in so-called quiet sectors, because in these sectors the garrison is but a small one to hold a very big stretch of ground. This stretch of ground has to be kept in good condition, so the men must work, and this is generally possible only during the



German Trenches

No Man's Land

French Trenches

A VIEW OF FRENCH AND GERMAN TRENCHES

night. At night men do not sleep. They set to work at eight o'clock and work all through the night until dawn, sleeping during the daytime. In daytime they also have to do the fatigue-work in the trenches and keep them in good condition, besides furnishing the watchers.

In most dugouts there are observation-posts from which by the aid of periscopes the enemy is watched, and this is especially essential when a heavy bombardment takes place and the enemy is liable to launch an attack.

There are but very few troops in the first line. Quite close to the enemy there is a line called "Line of Outposts." These outposts are small elements of trenches communicating by means of boyaux with the first-line trench. In these outposts are generally a corporal and three men. The outposts and communication-trenches leading to the first-line trenches are protected with barbed wire. In the first line itself there are but few men and no dugouts. Then comes the line of resistance, so-called main parallel. This line of resistance is occupied by a stronger garrison, and there is also a line of support for this resistance-line and at a distance a line of strongholds where there are some reserves. At a distance behind there is the intermediary parallel, that is to say, a line of trenches protecting the positions of the guns. Then at last the emplacements

for the batteries. These lines may be doubled and have several support-lines, but this is the form on which the so-called position is built. There are at least two positions and generally three and four and often more. The positions at the rear are but half occupied if they are at all, but there are always troops at rest-billets who know which of these positions they are to occupy in case of emergency. In the resistance-line there are about two-thirds of the garrison occupying the position from the listening-posts to the line of strongholds. Out of these two-thirds about a little less than one-fourth occupies the first line and the listening-posts. This makes clear the great echelonment in depth.

It is very striking and interesting to stroll along in the trenches during the daytime. It really seems as if they were deserted, only when from space to space you find a man who watches, and that is only in the first lines. In the other lines most of these watchers are in dugouts and observation-posts and are not to be seen. At night it is quite a different thing. Life begins again and constantly the ground is illuminated by rockets, sent up by both French and Germans, which fly up in the air and make a ghastly white light. This lasts but a few seconds, and then again rockets are sent up so that watchers may see what is going on. Thus the whole line is illuminated and one can easily make out the shape

of the lines by this illumination. From time to time rockets of different colors, green, red, and rockets with different streaks fly up into the air, and these have a special signification. Most of the time they are signals for the turning loose of a curtain of fire. Very often a nervous enemy asks for a curtain-fire fearing an attack when that which alarmed him was only a rat that made some noise in the barbed wire or in the tin box of rations. The watcher must be constantly on the alert and see and hear everything that is going on. If he hears the Germans working in their trenches the commanding officers calculate as exactly as possible on their maps the place where the German fatigue-parties are, and send this information to the artillery, asking them to fire upon them. This is also done when it is heard that the Germans are having traffic on their roads. Of course, this depends upon the direction of the wind. If the wind is favorable every noise is plainly heard. From time to time artillery fires on special points, often without warning to its infantry. These points are called sensitive points, for we know that the Germans are obliged to pass by them. Most of the time in these so-called quiet sectors during the whole night the rattling of the machine-guns and the cracking of rifles is heard. The German sentries are ordered to fire from time to time. Also the machine-guns send occasional showers of

bullets in order to sweep the ground, and prevent any traffic or to hinder our fatigue-parties.

At night patrolling is very active. Each company sends a patrol at a certain time out in No Man's Land in order to ascertain if the Germans are preparing for some mischief or to get a closer view of their first lines, and see what new works they have begun. Sometimes French and German patrols encounter each other in No Man's Land, and at such times they generally have a hand-grenade fight. Often when a patrol has some difficult mission to accomplish the men crawl out with only a rifle or a bayonet, and with their pockets full of hand-grenades, but it is necessary to have the patrol strong enough to meet any emergency. It is rather difficult to afford our patrol any help if it is fighting with a German patrol, because if we fire from our first lines there is a great risk of hitting our own men. Artillery can be of no use in this case. The hours at which the patrols go out are given to the artillery so that the guns will not fire at that time. A very great difficulty in this patrolling is to find one's way and to appreciate the distance which has been covered, for the time seems very long to the men on patrol, and most of the time they make gross mistakes in appreciating the distance they have covered. They must be specially well-trained men, have very good eyesight and be able to dis-

tinguish well in the darkness. Every man is not able to do this. Then there is the great difficulty in finding one's own way back, and this may seem a very easy task, but practically it is not, because in No Man's Land it is quite impossible to find a particular point to assist in keeping the right direction.

While some of the men are watching and others patrolling, the rest are working hard to dig new positions or to construct new defenses. The work has been planned during the daytime by the officers and non-commissioned officers who have seen exactly what they are to do, and they place white tapes on the ground so that when the men work at night they have only to dig according to the direction afforded by the white streaks. This also is very important because it is nearly impossible to give proper directions at night. One has great difficulty in finding his way, and very often serious errors of direction are made. I remember in the Somme near the wood of Saint-Pierre-Vaast we were preparing an attack in the beginning of November, 1916, and I ordered some pioneers of my battalion to dig jumping-off trenches which were to have a general direction facing to the north. One of the officers had not prepared the work during the daytime, and the jumping-off trench which he and his men dug was constructed facing to the west and had to be dug again the next day.

A great amount of war material is required for the maintenance and the building up of the positions—barbed wire, posts, iron stakes, concrete, wooden frames, planks, nails, steel observatories, steel shields, sand-bags, etc. All this is transported as near as possible to the first lines by narrow-gauge railroads, and then on trucks or on railroad-cars drawn by horses or mules. Finally the men are obliged to carry all supplies to the points where they are to be used on their shelters. It is really very trying to see the poilus in the narrow trenches and boyaux dodging along heavily laden, often two or more soldiers staggering along with some article of too great weight for a single carrier. Also there are supply-parties which bring food from the rear. The company kitchens are brought at night as close to the lines as possible, and then the men carry the food in to the troops who occupy the trenches. Of course, there is no regular time when the troops will get their food, because that quite depends on the enemy. If the enemy is nervous and constantly shelling the rear, the convoys cannot approach the lines, and when they do reach the lines the supply-parties often cannot go ahead, being stopped by a heavy barrage fire; so most of the time the food comes at a late hour to the dugouts and the men will not eat until the next morning, heating their food by means of alcohol-burners. The dugouts

in winter are heated with little stoves, and outside of the trenches the watchers often have braseros.

The working-parties always go to work armed with their rifles and ammunition in order to be able to meet any emergency. At night units which are billeted at the rear come and work to repair the positions. In the offensive sectors, where the troops in reserve are billeted close to the lines, these troops come every night to work and prepare the positions from which they are to start on the day they will attack. Thus they get accustomed to the ground on which they are to fight.

Officers make the rounds of the trenches at night to ascertain whether every man is watchful. Generally in each platoon there are two corporals and one non-commissioned officer on duty, and for the company one officer is on duty. For the battalion one company commander is always on duty. All these officers and non-commissioned officers make the rounds of the sectors occupied by the units they are on duty with; every incident is noted, and is reported next morning to the battalion commander, who sends his report each morning to the colonel. The reports go to the battalion headquarters at about four o'clock in the morning, and the major or the captain who is second in command of the battalion reads them over and sends the report for the whole battalion to the colonel's command post.

If any event of importance should occur it would, of course, be reported immediately.

The working-parties who are in the sectors of other units are required to put themselves under the orders of officers in command of the sectors should the enemy attack. In Verneuil, on the Aisne front, in January, 1917, where we were preparing to start our big offensive of May, 1917, one night there was in the sector of my battalion a battalion of Morocco troops and another battalion of French troops when the enemy launched an attack on the front of my battalion. These two other battalions gave us valuable assistance.

The troops cannot stay continuously in the trenches. They must be relieved in order to get some rest, for, as it has been explained, this life in the trenches, even in the so-called quiet sectors, is a trying one, and also it is necessary that the men be supplied with a change of clothing and be able to bathe. This naturally cannot be done in the front-line trenches.

The length of time which units remain in the trenches varies according to the amount of fatigue and the losses sustained by the troops occupying the sectors. In lively sectors reliefs take place more often than in quiet ones. Should the weather conditions be very bad, reliefs occur more frequently than otherwise. Changes should not be too frequent,

because relieving the troops is a very difficult operation, and during the night of the relief the work cannot be done as it is ordinarily. As a general rule, men remain in the front-line trenches at least four or five days, and sometimes they stay a fortnight or more. The relief is complicated on account of the difficulty in finding one's way, each communication-trench being like the others. As reliefs can usually be accomplished only at night, because the enemy would become aware of this unusual movement in daytime and open a barrage fire, it is necessary to send forth guides from each unit to take in charge the relieving units at the entrance of the trenches. The guide for each platoon reports to the leader of the platoon and walks ahead, then the whole platoon follows, one man behind the other in the trenches, and on they go until they arrive at their positions. There the platoon leader sees and talks the matter over with the platoon leader he is to relieve. He gets acquainted with all the peculiarities of the sector, and then the men are relieved. The corporal of the unit which is to be relieved takes his mate over the sector and shows him where the outposts are, and both go and relieve the men. As a matter of fact we have adopted the custom of sending the officers in before the relief takes place. At least the colonels, the majors, and the captains are sent one day ahead in order to

become thoroughly acquainted with the sector. They learn how to find their way about and also they find out what are the habits of the enemy. There they wait until their men arrive, but the officer who is relieved does not go away—captains and majors and colonel stay one day with the officers who have relieved them in order to give them all information which could be useful. Thus, the officer who is to take in charge this new sector stays forty-eight hours with the officer whom he relieves, and it is supposed that after this time he knows all peculiarities, and can manage the defense alone.

In all organized sectors the operation of relief is long, but is not much more difficult in offensive sectors than in quiet sectors. In offensive sectors one great difficulty consists in finding out one's way, because there are no more communication-trenches, only a zone of shell-holes in which even the guides are not able to find their way. This is easy to understand, because they are unable to find any special point which could attract the notice, and assist them in helping them out. Sometimes such stupendous shelling takes place within a very short time that the aspect of the landscape is soon changed, and this increases the great difficulty of finding the way to some special point. Of course, the aid of a compass enables one to find the general direction, but it is impossible to find the special dug-

out looked for, or more generally the special shell-hole which you want to reach. Maps are of but little use, because they show you villages and woods which seem to offer very good points of direction. When you come where they are supposed to be, little trace of either woods or villages is found. Woods are but a few blackened stumps which extend their shattered arms toward the sky, and the villages seem to have been completely wiped off the ground. For instance, of the Vaux village near Verdun there remains only crushed stone and it is a hue lighter than the ground. This, of course, cannot be perceived at night. In the Somme, I was once at a place called Marécourt with the general commanding my brigade. Wishing to find out where the church had been, we asked one of the soldiers where Marécourt church was, and the man answered: "You are standing upon it."

To give an idea how difficult it is to conduct a relief in an offensive sector, I will tell you of a relief on the Somme on the 19th of September, 1916. We were billeted about twenty miles from the lines. From there the major and the captains were taken in automobiles as near as possible to the lines. Then they met guides and went to get in touch with the officers whom they were to relieve, after which they came back to Suzanne, which lies some seven or eight miles from the lines. The men were taken

in trucks to Suzanne, arriving there about three o'clock in the afternoon. At four o'clock the major and the captains returned and the whole battalion started on the march at five o'clock. We reached the first lines at eight o'clock. Marching was very tiring, because the roads were in bad condition and cut up by shells, these roads having been in German hands and taken by us in the last drives. All the companies marched on with their guides, the major at their head, and he directed me to go with the last unit, that is to say, the machine-gun company. This machine-gun company had walked only for about a quarter of an hour before the Germans put down a barrage with gas-shells, and the men and officers were obliged to put on their gas-masks. It was most difficult to proceed from shell-hole to shell-hole with masks on, and especially as the machine-gunners were heavily loaded with their machine-guns. After we had walked for some time the captain commanding the company, who had just come from the lines, asked the guides if they had not made a mistake. The guides assured him that they knew their way perfectly and that they were on the right track. After a while they became rather uneasy and said that they did not know where they were. We then encountered a carrying-party which was proceeding forward. I asked the non-commissioned officer in command of this party

if he knew the location of the brigade headquarters, where I wanted to go first. That man told me that he was going there and that he knew the way perfectly, so I ordered the machine-gun company to follow this carrying-party. But after a while I heard some of the men of this carrying-party mutter that the non-commissioned officer had misled them and that he was going the wrong way. I asked him if he knew his way. He said he thought he knew it, but was not perfectly sure and it appeared after a while that we were completely lost. It was now half past two in the morning and we did not know how far we were from the lines we were to occupy, so I ordered the company to stop in the shell-holes and with the guides and the captain proceeded along in order to try to find the brigade headquarters we were seeking. After a time we did arrive at a brigade headquarters, but this brigade was three brigades south of the place which we wished to reach, but they gave us the right direction. We then had to find our machine-gunners, and this was not an easy task. At last we mustered our men together, and when we did arrive at our destination it was half past three in the morning. We had been walking practically, without stopping, since five o'clock of the previous afternoon.

When the units are relieved they march back to their rest-billets, each platoon proceeding by itself

to the rear of the lines, where at an indicated place the captain assembles his company, marches it to the battalion rendezvous, and then the whole battalion proceeds to the billets, where the men spend their time of rest. It is directed in the relief orders that some communication-trenches will be used only by the relieving troops and others by the troops which are relieved. This has to be done, for if the two units encountered each other in the communication-trenches, which are very narrow, it would take a very long time indeed to effect a relief, and as the men carry their full packs, they are not able to pass each other.

CHAPTER XII

THE DEFENSIVE BATTLE

IN speaking of defensive battles I refer to great encounters such as the struggle at Verdun in 1916, which was a defensive battle for the French, the battle of Picardy in 1918, and the actions in Flanders, where the Germans were on the defensive. Raids of more or less importance, even though many troops take part in them at times, are not considered as battles.

I shall try to make clear to you, first, how we become aware that the enemy is about to launch an offensive, and, next, to explain the measures which are taken to meet the enemy and to hold him at bay.

When an offensive is being planned by the enemy a large amount of constructive work must be undertaken by him, not only at the front but also at the rear. To begin with, all means of communication must be placed in the very best condition in order to accommodate the greatly increased traffic which they will be called upon to bear, and new means of communication must be created, for naturally there exist only those which are necessary for the ordinary existence in the trenches, which

are quite insufficient. New railroads are built, new roads for guns and trails for infantry must be arranged for, and positions have to be prepared in the front line for the artillery which is to prepare the attack. Many requirements must be met for infantry dugouts and sufficient shelters to cover the assaulting troops before they go over the top, and numbers of dumps have to be provided for the storing of the great masses of war material which will be required. Much of the work cannot be concealed, particularly that pertaining to roads and railroads. Our airplanes locate the new works immediately and they are made prominent on the aerial photographs taken by the aviators. There is also an unusual amount of traffic on the roads behind the enemy's lines which will be noticed by the planes, and in the lines it will be noticed that the Germans are more actively at work than usual. Another thing which announces an attack is the attitude of the enemy's artillery and the activity of his air service.

All these signs give the alarm to our High General Staff which thus becomes aware that something is about to happen. An effort will be made to estimate correctly the intentions of the enemy, to decide where and on which front he will attack, and to calculate his available resources. This is, of course, no easy task, for the enemy will always try to se-

cure the advantages of a surprise and will use all possible means to deceive us. On different parts of the front he will erect works which have an offensive character, and the available divisions which have been kept in reserve will be brought close to some places where there will never be an attack, this being done with the object of deceiving the inhabitants and the secret agents which we may have within the lines of the enemy. False reports are spread by means of the newspapers. A good example of this was offered by the Germans in the beginning of 1917 when they concentrated troops at the Swiss frontier and the newspapers published stories to the effect that Switzerland was to be invaded. The enemy did this with a view to forcing us to send troops to the frontier to meet the possible invasion, and in that way compel us to postpone our offensive of April, 1917, on the Aisne.

It is a very difficult task for our staff to acquire the information which is needed in order to take appropriate measures for meeting the enemy's offensive. For this purpose secret agents are constantly on the lookout for all possible clews relating to the enemy's movements and his prospective actions. Planes are active in reconnoitring and taking photographs. These photographs are compared with the ones previously taken and all changes noted. Raids are ordered on all the fronts in order

to secure exact information concerning the number and the identity of the divisions holding the front. Information is secured by the Allies, who report which divisions are on their front. The prisoners are questioned about the number of divisions which are at rest-billets. In this way it is possible to learn how many divisions are holding the front and how many are in reserve behind the front. If the number increases the enemy may have offensive purposes, particularly if we have not started an offensive. Then, little by little, we learn that the density of the troops in some sector has augmented, that numerous troops are at rest-billets training for an offensive, such troops being either close to the sectors from which the enemy is to start his attack or in close proximity to places well served by railroads and roads which will provide speedy transportation to the front.

All this information is collected by the General Staff, which controls the various sources of intelligence and which then takes measures accordingly. But it is always very difficult to locate exactly *where* and on which front the attack will take place, or, rather, where the principal attack will take place, for very often other attacks take place which are merely demonstrations. For instance, before the Germans started their attack on Verdun they first attacked on various parts of the front in the north, in Cham-

pagne, and in Lorraine. It was impossible to shift all available troops to Verdun, although we knew that we should be attacked there. But we also knew that we should be attacked on different parts of the line and we could not determine just what importance these other attacks would assume. So, when it appears that the enemy will launch an attack the High General Staff is obliged to take special action. The first measure is to assemble a number of troops who are kept in reserve to meet any emergency. The number of troops assembled will, of course, vary according to the general situation and to the supposed strength of the enemy's attack. These troops will not be placed in the trenches which we believe are to be attacked, but in a place affording every facility for rapid transportation to different parts of the front, either by trucks or by railroads. This is done to avoid a possible mistake in the dispositions, for it takes a much longer time to shift large units kept in reserve close to the line to another part of the front than to transport them to any part of the line from a well-selected rest-billet zone.

Next, the staff arranges for the assembly of all the war material necessary, especially many guns of all calibres and ammunition in great quantity to feed them, for the guns are big eaters. The ground on which the battle is to be fought is considered with

great care. Defenses are bettered and new positions are created at the rear, that a stanch and spirited resistance may be offered, and also to afford shelter for the reserve troops.

The first position is studied and all possible improvements are made in the existing positions, the work beginning at the rear positions, for the very first lines are doomed to utter destruction. Every effort is made to conceal in a network of trenches all important points of defense, including the strongholds, points which are favorable for the development of flanking fire, and machine-gun emplacements, the latter screened by camouflage. All possible steps are taken to prevent the enemy from knowing exactly which are the important points, and if he does not literally destroy everything he may have uncomfortable experiences.

It is nearly always necessary to change completely all the positions when an attack is expected, because the enemy is thoroughly acquainted with all the details of our lines. So machine-gun emplacements are changed and the new ones are never used prior to the actual attacks, in order not to betray them.

The local staffs determine where the enemy is to attack and which portions of the ground he will cover. The ground is prepared so as to break up the enemy's assaulting waves, to force them to pro-

ceed in separate columns in special zones, these columns being isolated from each other by strongholds. The isolated columns then reach the special areas where we are ready to meet and destroy them, either by deadly artillery barrage or by infantry and machine-gun cross-fire. The enemy's plan is to succeed in occupying our entire position, and this must be prevented at any rate. We must be able to retain a foothold in the positions which are nearly entirely destroyed or occupied by the enemy. We will have some strongholds, or centres of resistance, which are still occupied by our troops, who will afford valuable assistance when we start the counter-attack. So, you see, the defense of the ground is not only a frontal one but also a lateral one. That is to say, the ground is divided into a certain number of zones or localities which are independent of each other and which are able to hold firm even when the neighboring sectors have succumbed to the enemy's power. Of course, if the enemy has such a menace on one flank his advance will be stopped, or if he continues his advance we will have an opportunity to deliver strong counter-attacks on this salient which his men form, and we will also be able to bring great concentration of artillery-fire on this particular spot. Every man, every officer, every leader, knows that in the defensive battle he must cling to the ground and die where he stands. He

is never to retreat, even if his neighbors have fallen back, because in resisting they are given time to regain the lost ground. On the 23d of June, 1916, at the Bois Fumin my regiment did not retreat, although the regiments on both flanks had fallen back, and by our holding on the French troops were able to deliver a victorious counter-attack which gained back nearly all the ground which had been lost.

Very strong centres of resistance are created, shelters made of concrete or deep dugouts afford cover to the men during the enemy's bombardment, and flanking positions are selected with the utmost care. The men are well acquainted with these, but they are never used beforehand, in order that the enemy may not become aware of their existence. All these important parts of the line are concealed by camouflage. Quantities of barbed wire are used as a means of defense for the first lines. These measures are taken in order to force the enemy to shell the entire first position if he wishes to gain a foothold, but the utmost care is given to the last lines of the first position, and more especially to the second position.

Observation-points are carefully selected, for in the defensive battle if we want our men to man the parapet it is necessary that they should know the moment when the enemy will attack. This is,

indeed, very difficult, because the shelling is so intense that nobody can hear anything and the smoke and the dust prevent one from seeing. At Verdun, when I was there, the artillery could not see the rockets we sent on account of the smoke and the dust, which formed a dense cloud surrounding all our lines.

The enemy's infantry starts its attack so suddenly and follows its creeping barrage so closely that very often the assailants reach the lines before the garrison is aware of it. This can only be avoided by the selection of well-chosen points of observation, not only in the first lines but also at the rear, which are capable of furnishing information for the loosening of our curtain fire and giving time and notice to our infantry.

Another matter which requires painstaking attention is the disposition of our forces. They must be echeloned in depth. In our first lines we have hardly anybody except watchers, the main body of our troops being at the rear in well-sheltered dug-outs. The first lines will be destroyed, but our troops who are at the rear will have time to encounter the enemy before he reaches this latter position, and the foe will have been obliged to expend an enormous quantity of shells in destroying the first-line works and in killing a very few men. The intention of the defense is not to prevent the enemy from gain-

ing possession of some parts of the position but to hold our lines. Experience has proved that it was much easier and much less costly to force him out of the trenches captured, by an immediate counter-attack, than to try to prevent him from entering our first lines by cramming them with troops. In doing the latter we would only augment our casualties without any benefit, for men are not able to resist this avalanche of fire.

Another detail which must be taken care of is the condition of the means of communication. New roads and paths for the infantry will be prepared which allow the reinforcing troops to go quickly to the lines. All means of *liaison* must be improved whilst we have time, and especially the main telephone-lines, which should be buried at a depth of at least two yards.

A very sure sign that the enemy is to start an offensive is when he begins registering fire with his artillery with more intensity and with greater care than usual, also when the air service conducts a great number of raids. Before the battle of Verdun the Germans made many raids over the French front trying to destroy our railway-stations and other points of importance. Of course, our aviators encounter the enemy's flying-parties, and we also carry on raids, in order to interfere to the greatest possible extent with the enemy's offensive opera-

tions. The foe will order infantry raids in order to ascertain which troops and how many of them are in front of him, and also to learn how many divisions have been brought to the rear of the sector he intends to attack.

At last the enemy's artillery preparation will begin, pounding our lines and destroying our trenches. Our artillery will answer and will open fire upon the enemy's artillery and upon his lines, causing much havoc in his jumping-off trenches. Not all of our batteries will fire, as it is desired that they do not reveal their location. They will only fire on the day when the enemy actually launches the attack, in this way causing him great annoyance, as he will not be able to do counter-battery work, owing to his failure in locating all the emplacements of our artillery in advance. The staffs of the reinforcing troops will be allotted, and they will proceed to their commanding posts in advance of their troops in order to follow the progress of the battle, and to become well acquainted with all the peculiarities of the ground. The local commanding officer will have a plan of counter-attack, and will not have to wait for special orders for launching this counter-attack. As soon as the enemy has attacked, the reserve troops will counter-attack without further orders, and the sooner the better. The battle for the enemy will thus consist of two different phases.

First, he will have to fight with the garrison of the first lines; after he has secured those lines and is trying to organize them he will then be speedily attacked by troops coming out of their shelters unhurt by his bombardment. The rôles will be reversed, and he will be attacked and will have to defend himself.

During the artillery preparation is a very trying time for every one, as all are aware that the attack will come, but one never knows just when it will come, and to live under such conditions is most terrible. The supplies cannot be brought up, the shelling is intense, it is nearly impossible to have any communication with anybody, the wounded lie where they fall and cannot be taken away, and the dead cannot be buried. Officers and men undergo a severe nervous strain, for one must be in readiness to encounter the enemy at any minute, and to die if necessary where one is. Reinforcements must not be expected and there must be no falling back except in compliance with written orders, even though the enemy is on our flank. From time to time the enemy's artillery-fire increases to a "drum fire," the ordinary shelling continuing day and night, and you may be sure that this ordinary shelling is terrible. This awful shelling has a very curious effect on one. It makes one very sleepy and it becomes quite hard to keep awake. At Verdun I saw

men who fell asleep in shell-holes under the most intense shelling.

In a very short time the aspect of the whole position is changed. All the defenses, all the trenches, all the communication-trenches disappear as if they had been swallowed up, and there remains only a field of craters, in which there may remain some dugouts which have resisted. Then, at last, the enemy's barrage moves on, a creeping barrage which the hostile infantry follow in a wave formation. All the power of the artillery will be concentrated on our second position and all our means of communication will be kept under a terrific fire. Fleets of planes, flying low, accompany the creeping barrage and the infantry. High in the skies squadrons of planes form an aerial barrage to prevent our planes from passing. When this happens fire from all points will be turned on the enemy in the sky. Our artillery, with all its power, will turn loose a barrage to protect our infantry, and batteries from new positions will open fire as rapidly as possible against the enemy's artillery. Our infantry, machine-guns, and automatic-rifle men will be firing into the enemy's assaulting waves, trying to break them down by the violence of their fire. Then hand-to-hand fights will occur in isolated shell-holes. But the mass of the enemy will roll on to some particular point where they will try to establish themselves. Hardly will

they have reached this point when, in skirmishing order, French troops appear, and under the protection of a creeping barrage endeavor to throw back the adversary. If they don't succeed in regaining all of the lost ground, at least the enemy will have paid a very high price for his new acquisition, and will not be able to pursue his advantage.

In the defensive one must gain time. The troops which hold the line are only there to gain time to bring up the reserves which are at a distance in the rear. When the Germans attacked Verdun on the 21st of February, 1916, the divisions which held the first line resisted bravely during three days. The resistance of these divisions gave us time to bring up troops who delivered a victorious counter-attack.

Thus the defensive battle proceeds. The losses by attrition will be high for the enemy, while the battle rages on until his offensive capacity is broken down. Then we will launch a counter-offensive and reconquer the lost ground.

CHAPTER XIII

THE OFFENSIVE BATTLE

IN planning for the offensive battle the first question to be decided is the location of the sector where the offensive is to take place. This decision will be made by the general in command of the army. It is not as easy a question as would appear at first, for many considerations must enter into the choice of the sector, which must be one that will allow all branches of the service to participate in the battle, that is to say, the configuration of the ground should be favorable so as to permit of the deployment of great masses of men. Some sectors, such as the Argonne, being very hilly and very abrupt, are not favorable ones for an attack. The sector must be one which is of importance to the enemy, so that its loss would place him in an awkward position. Often this sector will be chosen because it is a great centre of communication and thus forms a vital part of the enemy's lines.

The offensive sector having been chosen, the work of the staff will then begin, and its task will

be a very long and difficult one, for the most careful consideration must be given to the many details, which are of the gravest importance. This war is a war of details. The side which has planned most accurately, without omitting anything, will have great chances of being victorious. The staff must also draw to the greatest extent on the imagination, in order to visualize what is likely to happen and to be able to realize what certain means will produce under certain circumstances. It must be able to realize what is humanly possible, and it must not count on superhuman achievements, which, although sometimes accomplished by gallant troops, should not be reckoned with as a probability.

The preparatory work of the staff will be embodied in written orders called the "Plan of Operations." This plan is issued a long time before the actual offensive, generally about two months before the battle begins. In it are indicated all the means which will be used for the purpose of the offensive and the results which are desired. The staff must calculate how many guns, how many men, and how much ammunition, both for artillery and infantry, will be necessary to attain the desired results. These calculations completed, the practical work begins and takes shape in the following way: first, the preparation of the offensive sector,

and, second, the relief and training of both troops and staffs which are to play a part in this battle.

The preparation of the ground can be divided into several parts: first, the making ready of means of communication; second, the digging of the works necessary for the troops who are to go over the top, which include jumping-off trenches, command posts, and so on; third, the creation of dumps, both at the rear and in the lines, for the storage of ammunition and material; fourth, the organization of the means of liaison.

The perfecting of the means of communication is a long task and has to be planned with especial care. These means of communication include the building of ordinary railroads, narrow-gauge (twenty-four-inch) railroads, and those which will be used for the railroad artillery; wagon-roads, which must be put in good condition and often newly built, and trails for the infantry which will be used only by the men and are not intended for vehicles. All of the above must be arranged according to a comprehensive plan in order that each unit may have quick means of transportation, so that the troops will not have to wait too long before reaching their emplacements for the fight. It is clear that if the means of communication are insufficient for even one part of the front there will be congestion in this particular place. This must be avoided, be-

cause it causes great fatigue to the men, who march one behind the other carrying full packs, and who, if obliged to wait for a long time, become very tired, which puts them in poor physical condition for the big drive. Should there be congestion as we near the zone of fire, these men, crammed together, make a certain amount of noise, which might attract the enemy's attention and result in an immediate shelling which would cause great havoc.

The first thing to be started is the construction of railroads, for that is the work which will require the longest time. Often new stations and railroad-yards have to be built, and stations which already exist must be put in condition to handle the tremendous traffic which will soon follow. As you may realize, our railroads were constructed in peace time to meet the requirements of commerce and industry, and they are not adapted to the special uses of war, so great stations are built as depots for the big units, and here the war material is unloaded and kept in special storehouses. From these stations there branch off narrow-gauge railroads, which run near the front and which bring war material to the dumps. From these dumps there are still other lines of narrow-gauge railroads, but the rolling-stock consists of trucks which use animal traction.

The existing roads are improved and widened.

They are generally six to eight yards wide and are so built that very intense traffic can run over them. Sign-boards are put up at many points, indicating the villages and places to which the roads lead. This last is important because it saves time which otherwise would be lost in studying maps, and prevents possible errors. New roads have to be constructed because those built in times of peace were intended merely for ordinary traffic between towns and villages, and much of the time they do not meet the demands of the present conditions. Horsemen and infantry are forbidden to use the main road, as it is especially used by the heavy artillery, and by the cars and trucks which run from places at the rear to dumps and to headquarters. But there are paths on either side of this main road reserved for their use.

For the use of infantry, which has to take the nearest way to the lines, trails are built. On each trail are sign-boards indicating the names of the trenches to which it leads and giving also the name of the place which can be reached by following it to the rear. Wire is stretched along the side of the trail so that when you have to go to the lines at night you don't get lost. On these sign-boards is also indicated which troops are to follow which trails. It will seem queer that such precautions are needed to prevent the troops from getting lost, but

one can never take enough precautions, for it must be borne in mind that often the attacking troops have come into their sector only a few hours before the attack is to take place, and if they should get lost, it would create a great disturbance in the plan of attack. Another reason for the sign-boards is to avoid useless tiring of the men.

Before we started the Aisne offensive my regiment left its rest-billets at eight o'clock one night in order to take up its position that same night and to start the attack next morning. It was pitch-dark and a terrible storm came up, making it impossible to see a man at a distance of three yards. In order not to get lost each man had to put one hand on the shoulder of the man in front of him; the officers held the wire in their hands so as to be able to find their way. In one place the wire had been torn away by shells, the column could not go on, and we lost about half an hour endeavoring to find our way to the lines. It must be realized that at night there is no perceptible difference between the trail and the ground around. It took us a very long time to reach our position, although we had a wire to guide us and guides to show the way.

All these various means of communication are built by groups, the men of which have specialized in this sort of work. One very important part of the task is the building of railroads for the railroad

artillery. These lines branch from the main railroad-lines, and run to places selected as offering the greatest facilities for the firing of special guns. Of course, several of these branch lines have to be built in order to use these guns in different places. There is very often a line of railroad which is connected with the main line in the rear, running parallel to the trench-lines. On this parallel line the guns and railroad-cars are transported, and it provides means for the later transportation of stores and supplies.

The digging of the works necessary for the troops who are to go over the top is rather a difficult task. The location of such works is selected according to tactical requirements. They are situated so as to shelter the assaulting waves, being very deep, yet affording them every facility for going over the top. They consist of jumping-off trenches. These differ from fire-trenches in that they have no fire-steps. They are only about six feet deep, and every now and then there are traverses. To allow of the men going over the top the trenches have either "jumping-off" steps which are staircases made of fascines, or individual steps which each man digs with his intrenching tool. The latter are perhaps better than the former because the men debouch in skirmishing order, whereas if jumping-off steps are used the troops leave the trench in columns,

and are obliged to deploy as skirmishers afterward, which takes more time and is less satisfactory.

The jumping-off trenches must be echeloned in depth in order to have the attacking units properly placed. They must also be provided with shelters and dugouts in case the enemy during the bombardment feels inclined to answer our artillery-fire by a fire of counter-preparation, that is to say, a destructive fire, upon our jumping-off trenches and our first lines. There must be not only dugouts for the men but also command posts for the different staffs, for on the day of attack they are all pushed ahead, the regimental staffs being in the first-line trenches. There must also be shelters for the ammunition and for the supplies which are stored up in the lines, in order to avoid as far as possible their being blown up. Of course, there must be communication-trenches to connect these new lines with the rear, as those already provided in the sector are insufficient for the number of troops to be found in the lines a few hours before an attack is made. If we should use them, there would be such a congestion and such a mixture of different units that it would not be possible to have all the units in good order before the attack starts. Besides, the more communication-trenches we have the quicker the troops will be in position.

All these new works are carried on principally

by troops other than those holding the sector, who will also labor in the offensive works but who are not sufficiently numerous to do all that is to be done. Generally the troops which are to attack are billeted at the rear close to the lines, and every night they go to the front and work at their jumping-off trenches. Before we started our offensive on the Aisne we worked in one sector where we were to attack from January to the middle of March. In having the work performed in this manner the attacking troops become familiar with all details of the ground on which they are to fight the offensive battle. Usually the infantry digs all the trenches and boyaux, and the pioneers and engineers construct the shelters. All these works are prepared in the daytime by the officers commanding the working-parties. During daylight they are able to observe all the peculiarities of the ground. They mark the lines of the works with white tape and at night the troops do the digging, the tape furnishing a guide which is visible in the darkness. Each man is assigned a certain task for the night, or a definite task is given to the unit, which stays at the work until this task is finished. For night work we generally calculate that one yard of trench entirely completed is to be done by each man, so if we have a platoon of fifty men, the platoon will not leave its work until the fifty yards of trenches are dug.

The digging of these works is supervised by the staff-officers, who see that the task is properly performed.

We must not only create depots for ammunition but also depots for material and water-supply. It is very important that the enemy does not become aware of the location of the jumping-off trenches, because should he know it he would get the proper range and might be able to concentrate artillery fire upon our jumping-off trenches; therefore, all works should in every case be concealed from his view by means of camouflage. Sometimes there is no way of preventing the trenches from being seen as soon as the daylight appears, so very often jumping-off trenches of the first line are dug the night before the attack. The troops forming the first wave are brought there a few hours before the attack, and they have to dig in before the day breaks; and as each man knows that it is for himself that he digs, I assure you that they are very keen on their task. They know very well that if at dawn they have not dug a trench they will be shot down by the enemy. This was done by my battalion for one attack which was carried out on the Somme. We were to attack the Epine de Malassise near Péronne on the morning of the 15th of October, 1915. The battalion arrived at nine o'clock in the evening of the 14th of October, and the men were

told that next morning they would storm the German position. They were halted at a place that was in front of our line and which was nothing but shell-holes, and consequently were obliged to dig jumping-off trenches that very night.

The organization of the means of liaison is carried out according to a "plan of liaison." This includes instructions concerning all the means of liaison we have at our disposal, the principal work being for the protection of the telephone-lines, which will have to be buried to a depth of two yards, and this must be done from the very first lines to well back in the rear, so as to avoid the enemy's shelling, which would cut the lines. Observation-points have to be selected with particular care, for during the offensive battle the commanding officers must be able to watch and see for themselves what is going on. These observation-points must, of course, be well protected. They are usually built of concrete, or are steel observatories brought to the lines in sections. The principal means of protection is always the camouflage which prevents their being seen by the enemy. All these observation-points are connected by telephone with headquarters, and, besides, each command post is provided with an observatory close at hand. All the other means of liaison are studied very closely, but do not require special works. The officers in charge of them will

often visit the offensive section to select the best places for their purpose.

Thus by continuous work the preparation of the ground proceeds, but it really is very difficult to make clear to you what an enormous amount of work is required for a big drive. For the Aisne offensive the work began four months before the attack and great numbers of troops were employed.

Another part of the preparation which must be worked out with particular care is the training of the units that are to play a part in the offensive battle. The very first thing is to select the troops who are to make the attack, have them relieved, and brought in to rest-billets. These rest-billets should be chosen so as to offer all necessary facilities for the training, including large open spaces which are not ploughed and where there are no crops. The units should not be too much scattered, for if they were the supervision of the instruction would be very difficult, and it would not be convenient to assemble the larger units such as battalions or divisions, which must be done, for the battle will be fought by large units.

The rest-billets ought to be pleasant and the troops at ease, for we wish them to forget all the hardships they have endured; we want, in short, a moral, a physical, and a technical training. But one of these cannot take the place of the other—they

all depend upon one another. A well-trained organization will prove useless on the battle-field if it has not a fine morale, that is to say, if it does not desire to prove its efficiency, and if it is not animated with a stubborn will to secure victory at any cost. On the other hand, if the troops have the most splendid morale but are not well trained they will not be able to accomplish results, for being ignorant of the correct methods of combat, their morale will only bring appalling losses upon them, and they will be mown down before being able to reach the enemy. Again, let us assume that a unit is well acquainted with actual methods of fighting but the men composing it are in bad physical condition; they will not be able to endure the fatigue which they will have to undergo. So we must take measures to insure that our attacking troops attain a high morale, that their technical training is satisfactory, and that they are in good health, strong, sound, and vigorous.

Good rest-billets must be selected, where the men have sufficient room with plenty of straw to sleep on. If possible, beds are to be provided for them. They should have all facilities for personal cleanliness and for the cleaning of their uniforms. The food ought to be plentiful and well prepared, so that the men will like it and eat heartily. Plenty of sleep, agreeable temperature, and good food will

soon restore the men to good physical condition, while games and gymnastics improve their form.

In order to raise the morale of the men, it is desirable to make them forget all the hardships they have endured, to help them forget the horrors of war. Being in good physical condition, their morale will soon become very good and then we try to amuse them, all officers striving to discover something new for their units. Some have plays, others challenge their comrades to football-games or to grenade-throwing matches, all of which has also a very good effect in developing that *esprit de corps* which is so important. The *esprit de corps* makes every man feel proud to belong to his unit, for he proclaims that this unit is the best of all in the French armies and that all men of this unit are a fine lot. That *esprit de corps* will make them perform wonderful achievements in order to outdo neighboring units. But the exaltation of the morale is really the work of the officers; they are in close touch with the men and have their confidence. They will point out to them the reasons why they fight, they will tell them why they must be confident of success, they will give them some indications as to how the next battle will be fought and the reasons why a success is expected, namely, the great superiority in guns, in ammunition, in infantry, and in morale that we shall have in this particular sector. Then as the

training goes on the men will feel and realize their superiority over the enemy.

Another sentiment which must be inculcated into every fighter is a strong hate for the Boche, a strong desire to meet him, to fight him, and to beat him. They become familiar with the thought that they will fight the enemy at a certain time under certain conditions. All this will not form a very formal part of the instruction, but daily the officers will talk with their men, read to them articles from newspapers and books, and tell them of the high deeds accomplished by their organization. In this way they will make their men feel as they do, and all of the unit, from the leader to the private, will form one body, one soul, animated with one single, almighty desire, to kill the Boche and drive him back to his country. All this training for the strengthening of the morale takes place daily, on every possible occasion, and its results are proven on the battle-field. To see the men fight more gallantly than they ever did is, for the officers, the greatest of all rewards, and such moments cannot be forgotten. As an example, on the 25th of September, 1916, on the Somme, my battalion in going over the top had to cross a barrage of machine-gun fire, and they marched forward in the most splendid style, singing the "Marseillaise."

Let us see how the technical instruction is carried

on before the attack. We must at first train the number of specialists we want, then drill the group of specialists, and afterward have all the specialists work together. The specialists who have been selected are thoroughly taught all details of the specialty which they go in for. Next the specialists' teams will work out, the bombers' team being taught how to fight in trenches and in shell-holes, either in defensive or in offensive, and the automatic-rifle team will be taught the tactical use of their weapon in offensive and defensive. At last the use of all specialties, the fight of the whole platoon, is practised. From time to time the individual training will have to be resumed, but daily the whole platoon works together. This is done in order to co-ordinate the training of the different specialists, which would not be possible were they always left to work by themselves. The men are trained and practised in the use of all their weapons, including hand and rifle grenades, machine-guns, and automatic rifles. They must become good bayonet fighters and marks-men. Other men than those qualified are also taught the use of the specialties in order to be able to replace the specialists in case of emergency.

Not only the men have to work out but the officers and non-commissioned officers also, for many of them have been recently commissioned or promoted, and the conditions of each battle are dif-

ferent from those of the previous battle. In every battle we use new material, new methods; our tactics are not like dogmas, unchangeable, and we take advantage of all that has been learned in previous encounters. It is but fair that the living should learn the lesson of the dead and secure greater success with fewer losses, so that the sacrifice of dead comrades will not have been useless, their sacrifice will not have been in vain. The officers and non-commissioned officers need to become thoroughly acquainted with all improvements which have taken place, and they are required to practise all new methods, not only on the map but also on the ground, and must learn to solve tactical problems. They should become thoroughly familiar with all of the methods, which have been found to be successful in offensive battles, and with the handling of units in close connection with each other.

The staffs which are to participate in this battle meanwhile practise on tactical problems analogous to those they will actually have to solve, and in manœuvring with the troops, putting them in positions which are, as nearly as possible, identical with those which they will occupy during the attack. Then the troops will go over this attack on a selected ground which closely resembles the one on which they are going to fight, the German positions being very carefully reproduced. The end in view

is to have every man, every officer, know exactly what he has to do on the day the battle will be fought. This is extremely important in order that confusion and disorder on the battle-field may be avoided. The men must be prepared for many deadly tricks, and great dangers will await them at a turning of a traverse or at the entry of some dugout, which can only be avoided if each one knows exactly where he is to go and what he is to do. The mechanism of the attack and the liaison with the artillery require a very close study and will not be learned in a short time. All this can be compared to a play which before being presented requires much rehearsal in all the details by its actors, each one of whom will go over his own rôle individually and then rehearse with his associates.

At the proper time the troops and different services will be placed in position. First the aviation service and artillery, then the infantry. The aviation service and the artillery work in close connection, for one cannot conceive nowadays an artillery force operating without the help of the aviation service—which is the eye of artillery. The first object to be attained is to gain the mastery of the air in this offensive sector. To accomplish this the chasers will try to bring down the German planes in order that the observation-planes may fly for the purpose of helping the artillery in registering.

Aerial raids are carried on to destroy the principal centres of communications at the enemy's disposal. The railroad-stations are visited by planes which hurl tons of explosives, while bridges, viaducts, important dugouts, cantonments, and barracks are also attacked.

After having prepared the emplacements for the batteries the artillery will begin registering, and then the artillery preparation will commence. The first position of the enemy will be destroyed by the guns which have a shorter range, more especially by the trench-mortars. The very big guns take under their fire the Germans' deep dugouts, such as the tunnels of Mont Cornillet in Champagne or on the Chemin des Dames, which are to be destroyed because there the enemy has sheltered the very important reserves. The means of communication of the enemy are kept under the fire of guns and machine-guns. Every minute tons of explosives are hurled upon the Germans' lines. In one of our latest offensives we fired over four tons of steel upon each yard of the German trenches. This terrific shelling destroys everything and the enemy's lines simply melt away. All defenses are blown away, the trenches no longer exist, and many dugouts are either ruined or have the entrances destroyed so that the garrison is blockaded and will usually be buried alive. You may imagine what the feelings

of the Boche must be. They were in a sector which was well organized, which possessed strong defenses, and which seemed impregnable, the defense being carefully arranged after two or three years of hard and constant labor. In so short a time by this appalling bombardment everything is destroyed, and in place of the well-planned trenches there remain but a few dugouts amidst a field of craters. Add to this the terrible noise which goes on by day and night, the smoke, the heavy losses sustained by the garrison, and you will clearly understand that the enemy must possess very strong nerves not to have a shaken morale. Every minute an attack is feared; the constant strain wears the men down very quickly, and most of the time no supply, no relief, no transportation of the wounded is possible. From time to time the violence of the artillery-fire increases into a drum fire. The enemy's artillery is constantly kept under heavy fire, and is especially subjected to gas-shells. Thus the first act of the battle rages on.

The artillery preparation being well under way, the infantry which is to deliver the assault is brought up to the positions from which it will deliver the assault. The placing of the units in position is not an easy task and caution must be observed not to be lost, as has been pointed out. Officers and non-commissioned officers make reconnoissances, then

guides taken from units holding the line are sent to show the way to the incoming troops and bring them to the places they are to occupy. Of course, these guides do not go back very far; they generally wait for the arriving units at the outskirts of the first position, and up to that point the troops have to find their own way.

In the last months mustard-gas has made it possible to have a shorter preparation of artillery and thus to take the enemy by surprise. These gas-shells, when they explode, sprinkle all over the ground little drops of a liquid which volatilizes into a gas called mustard-gas. These emanations last for several days and may oblige the defender to yield temporarily the ground. When the men stay for several hours on a sector gassed by mustard-gases they are strongly upset, but only if they stay several hours. This allows the assailant to cross a zone bombarded with gas-shells without any danger, whilst the defender is obliged to evacuate the position. A few hours before the attack is to take place a strong shelling gasses the garrison of the first lines and a strong counter-battery by gas will extinguish the personnel. This artillery preparation will last a few hours only, thus giving the enemy little time to muster his reserves.

The infantry which is to take part in the offensive battle having been brought to the first line, oc-

cupies all the jumping-off trenches. Very often this relief is effected during the night before the attack, but this is only the case for the troops which form the first waves of the attack. Before this relief takes place the troops occupying the offensive section will have made several raids in order to capture prisoners and get better information as to the morale and the strength of the Germans. Reconnoitring-parties will also be sent to ascertain if the work of the artillery has been sufficient. The day before the attack on the Chemin des Dames a platoon of my regiment entered into the German first line and carried away forty-seven prisoners and a machine-gun. This was done in daylight, but our shelling was so terrific that the Germans were quite unable to do anything to prevent us from carrying out this successful raid.

On the night before the attack the artillery will finish its work and the fire will increase in violence and prevent all movements of the enemy from the rear. During that same night our machine-guns will be most active, and all night long machine-gun companies will keep under fire all the rear of the enemy's lines and all the means of communication in order to isolate them. Our troops and our officers know that the attack will take place the next day, but they don't know at what hour. Some time in the night or early in the morning the staffs send to

the lines an order stating that the attack will take place at a given hour and all the watches are synchronized. In the operation orders the day of the attack is called day "D" and the hour is called hour "H"; so the staff at the proper time informs all the troops that day "D" means, for instance, the 5th of May and hour "H" is nine o'clock. During the hours just before the attack our artillery makes a supreme effort and the shell-fire is frightful, the enemy's batteries being under the most violent fire.

At the hour "H" the creeping barrage is put on the enemy's territory, moving along at a slow rate. On the rear of the enemy's lines a very heavy barrage is placed, and the hostile batteries are subjected to a still more violent fire. The enemy's second line is heavily shelled, all the guns which do not take part in forming the creeping barrage concentrating their fire upon those lines so as to permit our advance and to crush every tentative counter-attack. An encaging curtain fire is put on both wings of the attack so that the enemy cannot flee either to the rear or to the flank, and can only await the French bayonets advancing steadily toward him. On the other hand, the creeping barrage prevents the enemy from getting out of his dugouts, and when the last shells have fallen the front-line infantrymen are there.

At the same hour "H," along miles of the front,

waves of horizon-blue come out of the trenches and advance at a uniform pace toward the enemy, while batteries of machine-guns pour forth a shower of bullets forming a curtain fire in front of the troops. From all the jumping-off trenches lines of French soldiers march on in good order. Behind the waves are the moppers-up, who have the special duty of seizing the entrances of the dugouts and making prisoners of the Germans who occupy them. Over the heads of the assaulting waves swarms of planes fly at a very low altitude, firing with their machine-guns at every German who tries to make a stand. High in the air squadrons of planes prevent any enemy plane from crossing the line, in this way rendering the enemy's artillery blind. Other squadrons have passed over the enemy's lines to the rear and attacked the reserves, which are hurried up by the German staff to try to check our advance.

The assaulting waves protected by the barrage advance steadily, marching as closely as possible to this barrage. They go on to a designated point, but no farther, and then immediately begin to organize the conquered ground, that is to say, they dig themselves in and form a line of trenches out of the shell-holes in which they are. Next they endeavor to build communication-trenches. Immediately after they have stopped, the planes fly over

them and ask them to mark the line. At this signal the infantry spreads its panels on the ground, the plane takes a photograph and flies back to division headquarters, where the photograph is developed, and in less than two hours after the photograph has been taken the general knows exactly where the men of his division are. During that time other planes fly over the line and pay great attention to all signals which may be sent by the infantry, which asks for everything it is in need of—for instance, artillery-fire, longer range, etc. The planes also warn the infantry of any counter-attack which the enemy may plan.

Of course, most of the time the attack doesn't succeed in taking all the positions without a fight, as there remain some parts of the enemy's lines which resist, either because the artillery has not quite demolished them or because the garrison hasn't been sufficiently shaken by the shelling. Infantry then has to conquer these strongholds. They will do it by besieging them very closely, and if the infantry by its own means doesn't succeed in carrying them, the artillery has to resume the work. Often tanks (a type of armored cars, like caterpillars, able to progress on any ground and armed with guns and machine-guns) are in front of the infantry and protect it by fire-power. They also prove very useful in reducing the strongholds

which may prevent the infantry's advance. They cannot take the place of the artillery barrage, but as an addition to it they are of great assistance.

The great difficulty is not in conquering the ground but in holding it. To go over the top is nothing, for in a well-prepared attack the losses are but very slight during the assault. In the Aisne offensive on the 5th of May, in my battalion there was only one officer slightly wounded, one man killed, and twelve men wounded. Three battalions of Chasseurs à pieds carried the important position of the Croix-Sans-Tête with only three wounded and one killed, and there they took eighteen German guns. The assault in itself is not costly in human lives, but the holding of the ground results in many casualties.

After a few hours the enemy's artillery reaction becomes more violent and accurate, and intense shell-fire is directed upon our new line. As the men have no dugouts and the trenches are not well made, losses are more severe than in an organized sector. There is no general rule as to when the enemy will begin to direct his fire against our infantry. During the Aisne offensive we attacked at nine o'clock and the first German shell was fired at 9.35 upon the rear of our line. During an attack we made on the Somme on the 15th of Octo-

ber the enemy's artillery began shelling a few minutes before we started the attack. So the important occupation of all will be the organization and consolidation of the conquered ground. Before the attack is launched, orders will have been issued explaining to every one how the conquered ground is to be organized, and all try to realize this organization as quickly as possible and in accordance with the written orders. The organization of the ground is made in depth, and reserves are immediately brought up so that they may be able to counter-attack should the enemy succeed in reaching our line. Several lines of trenches will be provided for, and in each of these lines dumps for ammunition will be located. Fatigue-parties will bring up on the new lines the material and supplies for the organization of the position including ammunition, rations, and water. The assaulting troops will try to have good liaison with the rear so that they can report what is going on and to indicate what they need. Artillery will get the proper range for the new positions, and be ready to let the curtain fire loose in a few seconds. Fatigue-parties and territorials (troops composed of older men—will follow the assaulting waves at a specified distance to establish means of communication, to make trails, and to lay bridges made of fascines. The roads which are close to the former front lines are immediately

repaired, for now they can be used by the wagons, the lines being further away.

At this stage of the attack the infantry works more with the pick and shovel than it fights, and while some local encounter is going on for the reduction of strongholds or centres of resistance still capable of putting up a fight, fatigue-parties and most of the assaulting troops, under the protection of strong outposts, dig and work without losing a minute. There one sees the truth of the statement, "time is blood." Crowds of prisoners stream toward the rear. By every staff they are questioned, only briefly by the staffs of the attacking troops, but more in detail at the division and the army-corps headquarters. Very often the prisoners are immediately used for work in the repairing of roads at the rear. When it can be done the wounded are transported to the rear, but often this is an impossible task during the day, and we have to wait till the night falls for our stretcher-bearers to bring out the wounded, because the enemy fires every time he sees a living being move over the conquered crater-field. You will easily imagine what a difficult task it is for the stretcher-bearers to move in this upturned ground, amidst exploding shells and whizzing bullets—searching for their wounded comrades, putting them on the stretchers, and then, under the same conditions carrying them several

miles to the rear. Quite often the bearers sustain severe casualties. The wounded are carried to the first-aid stations, where their wounds are dressed, and they are sent further to the rear, where ambulances await to transport them to the field-hospitals. The wounded who can do so, walk back to the dressing-stations, often in groups of two or three, helping each other to get out of the dangerous zone. This evacuation is more or less difficult according to the enemy's actions.

If the attack succeeded very well, and it is noted that the enemy's lines are shattered, the success will be exploited, and other objectives stormed, but this will only be done by order of the staff. Most of the time the staff keeps in hand the reserve troops, which will be engaged in carrying other objectives and pursuing the retreating enemy. This can only be done should the enemy's line be pierced on a sufficient front and should the troops give way. The pursuit must then be very quick so that the enemy can have no time to recover, and so that his reserves will be carried away in a wild panic and be unable to fulfil their rôle—that is, to hold the ground and counter-attack in order to regain the lost positions. As soon as the assaulting infantry gets out of the crater zone, the cavalry passes the infantry and speeds on, forcing the enemy to a hasty retreat. The defeat may then turn into a disaster

for him. The guns are moved on, pursuing the enemy with their shells. The roads are quickly repaired, trucks carry infantry ahead so as to be at the heels of the enemy, who will have no time to save or even to destroy his material, his guns, or his ammunition. Hundreds of guns, thousands of prisoners will be the booty of the victory. A sufficient number of troops and guns brought into action will force the enemy to retreat over large spaces of country. The enemy will have but one chance to recover and that will be to occupy new lines far back to the rear, to occupy them with fresh troops who have not been under the influence of the defeat, well supplied with guns and ammunition, and having at their head an energetic leader. During this time the retreating armies will have to fight in order to gain time and to allow the concentration and the organization of these new forces. The rôle of the pursuer will be to crush down rapidly every resistance, keeping at the heels of the enemy's main forces, so that they can make no stop at the lines which they intend to defend. On great areas of country open warfare will be resumed, and a big battle must be fought if the pursuer is to be stopped. During this pursuit the air service will not be inactive. Squadrons will fly over the retreating columns in order to locate them and also for the purpose of attacking them, obliging them to scatter

themselves or to take cover, and delaying them in their retreat. They will be able to give the proper range to the pursuing artillery, and the object of the beaten enemy will be to gain time at any cost. The pursuer will have but one idea, one sole aim—to crush every resistance, to get at the main force and give the enemy no time to rest or to recover.

CHAPTER XIV

CONCLUSION

ALL the battles in trench warfare have not been fought under the same conditions and in some the objectives were widely different. Some battles were fought with the idea of piercing the enemy's front. To effect this it is necessary to push ahead quickly and steadily in order to get to the positions at the rear before the enemy has had time to hurl troops into them for the purpose of defending them. The troops must not only push ahead quickly on a small front, but they must do it along a large front, so that the collapse of the line will become general, and so that it will be quite impossible for the enemy to fill the great gap driven in his line.

Such a battle should, of course, only be fought with sufficient material and human means at the disposal of the general in command because it must be borne in mind that he must not only win the battle but he must be able to pursue his opponent, and compel a general retreat. It mustn't be forgotten that the enemy will have at his disposal quantities of reserves which will be hurled into the battle

or which will fight later on. This battle is not a last effort, but the first, surely the decisive one of a series of efforts which have in view the breaking down of the enemy's force of resistance. To do this the commanding chief must not only have the means with which to fight and win this battle, but he must be prepared for the emergencies which will follow. He must have sufficient troops, sufficient guns, sufficient ammunition.

The battle with limited objectives is fought in quite a different spirit. There we do not intend to pierce the enemy's front. Our only aim is to kill as many Germans as possible while we lose as few men as possible. The idea is to wear down the enemy by the stupendous losses which he will sustain. The ground he occupies is pounded in such a way that no human being can stand it; the attacking troops must take the objectives assigned to them, and no more. To fight such a battle it is necessary to possess an overwhelming superiority in material. It is necessary to be master of the air, and to have much more powerful artillery than the enemy. Should the enemy be able to muster the same means as ours then the object of this battle will not be attained, because he could reply efficiently and we should lose as much as he does.

The recent offensives in the Flanders, known as the battle of the Flanders, are types of battles with

limited objectives. These battles forced the enemy to engage all his reserves, and even to bring into the fray twice and sometimes three times the same divisions.

The conditions of battle have changed since the beginning of trench warfare. At one time we had a series of lines, now we have a series of nests. Now we use a series of centres of resistance sometimes connected by underground galleries at a great depth. The effects of artillery have been so terrible that it seems useless to build any sort of defense, because the stronger it is the worse its destruction. The idea is to keep the strongholds unknown to the enemy. For instance, a shell-hole in which a machine-gun is placed without the knowledge of the enemy forms a stronghold. Very often we develop underground communications with these shell-holes which cannot be detected by the aerial photos. The Germans used them, for instance, at the Cornillet in Champagne.

The form toward which this warfare slowly drifts is that of a defense organized at such a depth that a main position cannot be easily destroyed by the guns; and such positions are protected in front by several miles of shell-holes, mostly defended by material served by a few men. A very difficult job for the assailant is to get quickly through these positions, for if he does not push ahead quickly,

strong reserves will bar the way. There will be a great echelonment in depth, for the mechanical means of destruction are so powerful that it seems quite impossible to escape annihilation. The best defense is always camouflage, for if the enemy does not know the location of his opponent he will not fire.

The enemy has organized new lines at a great distance from the places where he is fighting now, and should we pierce his present lines his main object will be to delay us in order to give time for the retreating troops to muster, and shelter themselves behind these new positions; and open fighting would take place in the spaces which separate two positions. Our object would then be to gain on the enemy by speed, and therefore to manœuvre so as to cover the intervening distance quickly: thus it would become possible to prevent him from re-organizing under the protection of these new lines. If he were able to cover his flanks and guard them with strong obstacles he might be able to form a new line and keep a new position; so the object of the assailant will be to reach his flanks, and thus prevent the organization of this new position. The main difficulty will be that of clinging closely to him and of outflanking him.

I have tried in this book to give an idea of what modern warfare is, and it is essential fully to grasp

the meaning of this term. I have used the words trench and open warfare, meaning, in the first case, fighting to attack or defend a system of trenches, and, by open warfare, combat between two positions where there are no trenches. But it would be quite wrong to believe that these two forms of the battle are entirely different. There are some great principles which are always true, but their application differs with the conditions of the fight. For instance, a formation very effective in one country would not be suitable in another. It would be equally absurd to pretend that there is never fighting in the open, or that after a certain phase is ended we shall never encounter trenches. As a matter of fact, when two opponents halt, voluntarily or not, and want to keep a close contact they are obliged to settle down in an extensive system of trenches. To hold the ground it is absolutely necessary to organize it in order to reinforce the strength of a natural position. In attacking, the idea is always to shatter the enemy's armies, to break down all organization. Therefore, actually it is necessary on the Western front to break through the system of trenches, and the result to be attained is to hurl the enemy back in disorder, and quickly, in order neither to give him time to occupy the positions prepared long ago at the rear nor to cling to the ground and hold it by means of field-fortification.

On the other hand, every time one of the opponents stops he organizes the ground. The period in which the fight is carried on in the open is then very limited both in time and in space.



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